

Tips, guides and reports for people repairing televisions and electronic equipment

TELEVISION

AND HOME ELECTRONICS REPAIR

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Electronics in the intelligent home

Panasonic's Tau TV range

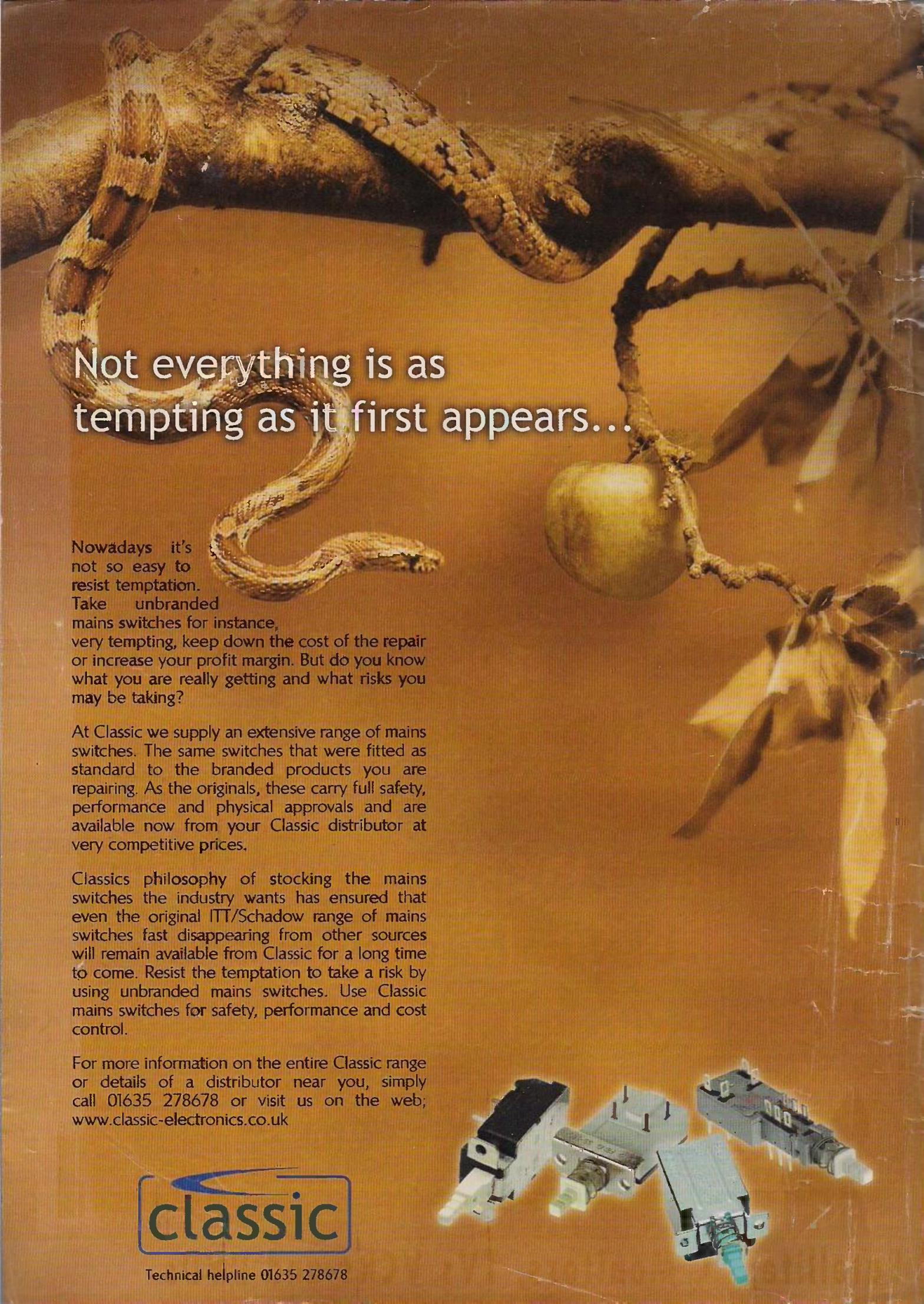
Installing car alarms and immobilisers

Black-level stabiliser circuit

Fault reports

Satellite, PC Monitors, TVs VCRs and DVDs





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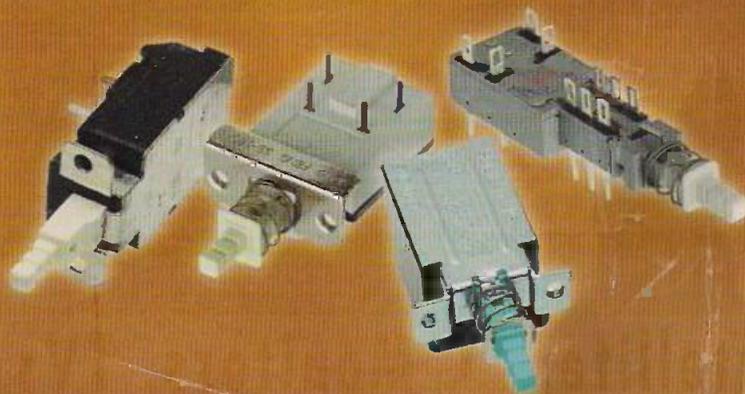
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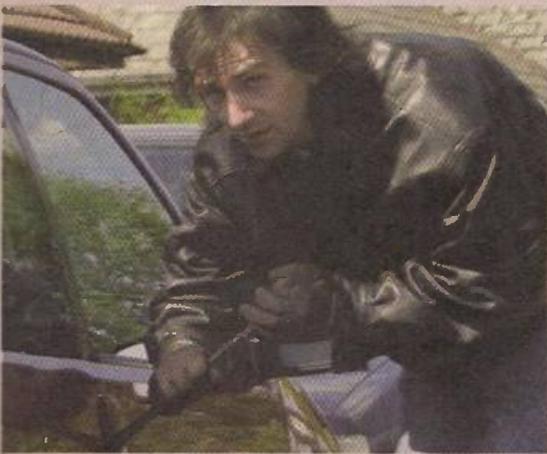
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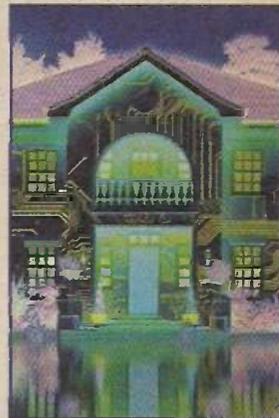
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Next issue, dated September, on sale August 15th.

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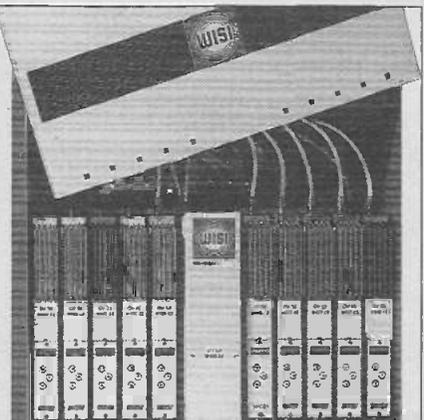
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The woes of ITV

One almost feels sorry for ITV, which is undoubtedly having a hard time. But, over the years, the ITV companies have made a great deal of money. No company or organisation can expect to make steadily increasing profits indefinitely. The economy doesn't work like that.

ITV's woes were highlighted by Granada's announcement of its latest results, for the first half of the current financial year. The company clocked up a pre-tax loss of £69m, after spending £121m on digital TV and exceptionals that came to £60m. There was an 11 per cent decline in revenue during the nine months to June, and things have been getting worse.

Just four months ago Zenith Media, a media planning and buying agency that produces highly-regarded forecasts, was predicting a 3.6 per cent increase in advertising expenditure this year. In view of the general economic situation, that indicated a degree of confidence. Zenith's most recent prediction however is that advertising expenditure will fall this year by 0.8 per cent. That might not sound like much, but it will be the first fall for a decade.

The ITV situation is far worse than this. Sales orders for July are expected to be down by some 17 per cent, and a decrease of 15 per cent has been suggested for August. Something like this should have been expected however. ITV advertising revenues were particularly strong last year because of bookings by the dotcom companies, which have now largely ceased to advertise. Last year the ITV companies were able to increase advertising rates. This led to a number of traditional ITV advertisers reducing their bookings. The situation now is that the dotcom companies are no longer providing much income while the traditional advertisers haven't come back. Nor has the extra allowed ITV advertising time helped: rates have simply fallen.

There is at present no sign of a recovery, while over the longer term ITV has seen its share of TV advertising decline. Five years ago it took 80 per cent of TV advertising revenue. With the growth of satellite and cable TV broadcasting, the ITV percentage of advertisement income has declined to 54 per cent.

The situation for Granada and Carlton Communications has been made much worse by ONdigital's poor performance. It made a loss of £121m in the first half of the current financial year. Breakeven wasn't expected until about 2003 of course, when ONdigital (to become ITV Digital this month) planned to have 1.7m subscribers. This continuing loss couldn't have come at a worse time for Granada and Carlton. Some large investors in

Granada have in fact called for ONdigital to be closed down.

ONdigital was set up, with great expectations, in 1998. Granada and Carlton originally envisaged an investment of some £300m. That was before Murdoch struck, with his free digital set-top boxes. ONdigital had to respond likewise. Largely because of this, Granada and Carlton have already spent £800 on ONdigital, and are committed to a further £300m. Whether this will see ONdigital through to breakeven is questionable. Subscriptions have got stuck at a level of slightly over a million. There are new subscribers of course, and these should increase as the service area expands. But the churn rate is high: it has been predicted as reaching 30 per cent by the end of the year.

Granada's problems seem to have caused its chairman Charles Allen to panic. This can be the only explanation for his extraordinary letter to the government seeking various concessions – mainly that legislation should be introduced to make it easier for media companies to merge. What he had in mind was clearly a merger with Carlton. Otherwise, he hinted, there could be takeovers by large international media companies and a possible end to ONdigital.

This didn't go down well with Carlton's chairman Michael Green, who commented that a merger with Granada was neither "inevitable nor necessary", adding that ITV could continue as a partnership "provided both sides understand the meaning of the word partnership". He emphasised that "our financial capacity is sufficient to see ONdigital through to breakeven". Carlton has however called for a reduction in licence fees, pointing out that it is unfair to expect ITV to fund the cost of setting up DTT while paying hefty licence fees and taxes. Fair point.

So what are the prospects for ITV? The companies are responding to their immediate problems in the traditional way, with cost control and job losses. This might help in the short term. In the long term ITV's future is, in effect, ONdigital, so things don't look too bright – the opposition is making all the running. If the analogue plug is pulled, will viewers dutifully take out subscriptions with ONdigital? If not, DTT will be left to the BBC and anyone else who cares to have a go. If this means the likes of the international media giants, the government might not be too concerned. In the Euro age, the government could find it difficult to prevent this.

What all this does emphasise is the continuing vital role of the BBC in UK broadcasting.

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INDEXES AND BINDERS

Indexes for Vols. 38 to 48 are available at £3.50 each from SoftCopy Ltd., who can also supply an eleven-year consolidated index on computer disc. For further details see page 632.

Binders that hold twelve issues of *Television* are available for £6.50 each from Television Binders, 78 Whalley Road, Wilpshire, Blackburn BB1 9LF. Make cheques payable to "Television Binders".

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Some back issues are available at £3.00 each.

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The logo for Cumulus Business Media features the word "Cumulus" in a large, bold, sans-serif font. Below it, the words "BUSINESS MEDIA" are written in a smaller, all-caps, sans-serif font. The entire logo is enclosed within a stylized, curved border that suggests a globe or a signal.

TELETOPICS

Electrical/electronic 'waste' disposal

Initial approval has been given by European Union environment ministers to a draft law that would force retailers and manufacturers to collect and dispose of redundant electrical and electronic equipment and also bans a list of dangerous substances. Manufacturers and retailers have launched a campaign against the proposal, which is known as the Waste Electrical and Electrical Equipment Directive, pointing out that its implementation is likely to be prohibitively expensive.

It has been estimated that the cost of dealing with 'historical waste' could exceed £5bn, while the continuing annual

cost could be some £1bn. According to the British Retail Consortium, the directive could cost electrical retailers as much as £500m a year. It points out that retailers would be forced "to become waste management companies". About 6m tonnes of electrical and electronic goods, including PCs, TV sets and domestic appliances, are discarded each year in the European Union. This figure is expected to increase by some 30 per cent within a couple of years. Under the terms of the directive, at least 4kg of this kind of waste per person would have to be collected each year. Recycling targets of up to 75 per cent would be set for each category of waste.

The Federation of the Electronics Industry, which now incorporates BREMA, says that in its present form the directive would, in comparison with a previous proposal that gave responsibility for collecting waste products to local authorities, double the cost.

A similar law was introduced in Japan on April 1st. Since then there has been a considerable increase in TV set, air-conditioner, refrigerator and washing machine dumping, in a country otherwise renowned for its tidy ways (regulations relating to PCs, microwave ovens, cars and other equipment are to be implemented at a later date, possibly in 2002).

Digital camcorder developments

Several new and interesting digital camcorders have been launched. JVC's Miniature, Model GR-DVP, is claimed to be the world's smallest, measuring 43 x 115 x 80mm and weighing just 340g (without battery), while being a multimedia device. It uses the MiniDV format together with JVC's Super High-band processor. Features include an 800,000-pixel CCD image sensor; Digital NightScope for extreme low-light work; a built-in XGA/VGA digital still camera that uses an 8MB SD Memory Card for storage (stills can be accompanied by a six-second sound bite); MPEG-4 file conversion for e-mailing images; MP3 technology for digital sound effects; SD Card/MultiMediaCard compatibility; a USB port; a DV input/output terminal (i.Link/IEEE 1394 compliant); a 2in. polycrystalline silicon LCD colour monitor, a 100x super digital zoom; and

digital picture effects. For this remarkable collection of features you will have to pay about £1,300. But there's more to it than that.

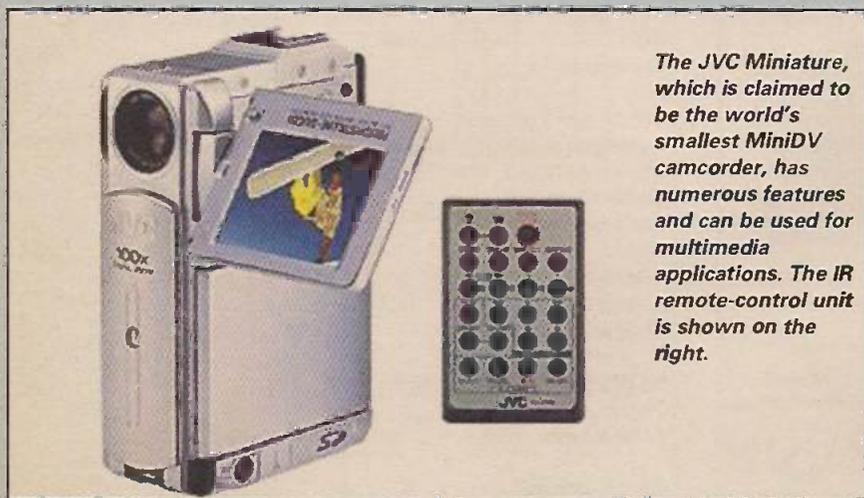
Each Miniature comes with Ucreate TV software, an on-line editing system, and a subscription to newplayer.com, which gives access to some 14,000 historical and news clips. The idea is that you can load home-shot footage to a PC, download the clips via the internet, and edit them to create your own finished material which, for copyright reasons, is stored at the Newsplayer website, but can be e-mailed to others. The software supplied for PC use includes Presto!'s Photo Album, Mr Photo and ImageFolio, to create digital photo albums, store and catalogue them and provide photo editing tools respectively.

Sharp's Model VL-ME100H is a digital

ViewCam with a 1.3Megapixel CCD image sensor and a built-in facility for storing 1,280 x 960 pixel (SXGA) still images on an SD or MultiMediaCard. A DV in/out facility enables the user to download digital video to a PC for editing then upload it back – the accessories include PixLab Lite PC software. Features include a 3.5in. detachable LCD screen with cable that enables the camcorder to be operated remotely using a touchscreen menu; an F1.6 10x optical zoom lens; and a 'Super Cat's Eye' circuit that gives monochrome recording under 0 lux light conditions and colour recording down to 1 lux – there's also a digital gamma adjustment option to increase the contrast and detail in low-light conditions. On the sound side there's a built-in microphone and an external zoom microphone. A range of manual overrides is included. Dimensions are 66 x 86 x 175mm, weight 540g.

Sanyo's iDshot Model IDC1000Z is somewhat different as it stores up to two hours of continuous moving images at 15 frames/sec with 160 x 120 resolution or 12,000 still images at VGA resolution (640 x 480 pixels) on a 730MB 50mm iD Photo magneto-optical disc. A blank iD Photo disc costs about £25: according to Sanyo it can store data for up to 100 years or be overwritten a million times. In the video recording mode up to eight minutes of S-VHS quality video can be stored on the disc. The data transfer speed is 20Mbits/sec.

Other features of the IDC1000Z include an 0.5in. 1.5Megapixel CCD image sensor; 3x optical and 21x digital zooms; an animation mode; programme AE modes; pop-up flash; a USB port; and an IEEE 1394 interface. Dimensions are 92.8 x 88.3 x 139.3mm; weight of the main unit is 575g.



The JVC Miniature, which is claimed to be the world's smallest MiniDV camcorder, has numerous features and can be used for multimedia applications. The IR remote-control unit is shown on the right.

Personal TV Recorders

BSkyB has released details of its Personal Television Recorder (PTR), a digital set-top box with a built-in hard-disk drive. The PTR service, known as Sky+, will initially be sold to SkyDigital's 5.4 million existing customers. Sky+ records the original broadcast stream, providing an average recording time of twenty hours. Key features include: the ability to record one satellite programme while watching another; being able to record favourite programmes automatically; single-button recording; a series link, which links episodes for a series for automatic recording; pausing live TV; freezing and recording on-screen action; Dolby Digital 5.1 compatibility; full

integration with Sky Guide, including the recently introduced Personal Planner; new channels are added automatically; accommodates time changes in programming schedules. BSkyB says the Sky+ box will complement its free digibox offer. No price details have so far been announced.

The BBC is to run a technical trial of PTRs developed by AXTechnology. Features are much as with the BSkyB PTR. The BBC is developing its own graphic interface and electronic programme guide, which are expected to be ready for demonstration at the IBC in September

Satellite TV news

Astra 2C was successfully launched from the Baikonur space centre, Kazakhstan, on June 16th. It is due to be stationed in orbit at 28.2°E, but will initially be positioned at 19.2°E to provide temporary back-up until the launch of Astra 1K.

Sky increased its installation charges on July 2nd. If a customer subscribes to the top-tier package at £34 a month the charge is now £50. For all other options the charge is now £70. Installers continue to be paid £42 per installation.

BSkyB has entered into an agreement with the Peterborough-based housebuilder Stamford Homes, which will provide a top-tier Sky Digital subscription with every new house it sells. A dish will be installed discreetly during the building work, and homes will have an average of five digital TV outlets. Previously Sky has arranged with many other housebuilders to provide prewiring for easy digital TV installation.

Sky Sports and Two Way TV have announced a partnership to develop new interactive programming for Sky Digital viewers. The companies aim to develop new enhancements that will be available with live interactive sports coverage.

Philex catalogue

Electrical and electronic accessories manufacturer and supplier Philex Electronic has launched a new 144-page colour catalogue that covers the complete range of products available from the company. Some 2,000 products are listed, including audio-visual, electrical, computer, telephone, networking, lighting and cabling accessories and also test meters, timers and DC accessories. The catalogue is available from Philex Electronic Ltd., Philex House, 110-124 The Broadway, West Hendon, London NW9 7PP. Phone 020 8202 1919, fax 020 8202 0014 or e-mail sales@philex.com

In brief

The ITC has announced plans to double the digital transmitter power at eight key sites: Crystal Palace, Sutton Coldfield, Emley Moor, Mendip, Oxford, Bilsdale, Black Hill and Winter Hill. These plans follow the current 'equalisation' programme being carried out at a number of transmitters to bring the coverage of the multiplexes more into line – the ONdigital multiplexes C and D are often transmitted at lower power than the other four. The objective, expected to be achieved later this year, is to bring the coverage of all multiplexes up to eighty per cent.

The Live consumer electronics exhibition is to become an annual event, alternating between London and Birmingham. This year's show is being held at the NEC, Birmingham on September 21st-23rd.

An expanded range of electrical and electronics products is being sold at five Tesco Extra stores across the country and via the company's website (tesco.com). Prices are rock-bottom. A 14in. colour portable is being offered at £63.82 and a 28in. Nicam set at £170.20.

Satellite radio

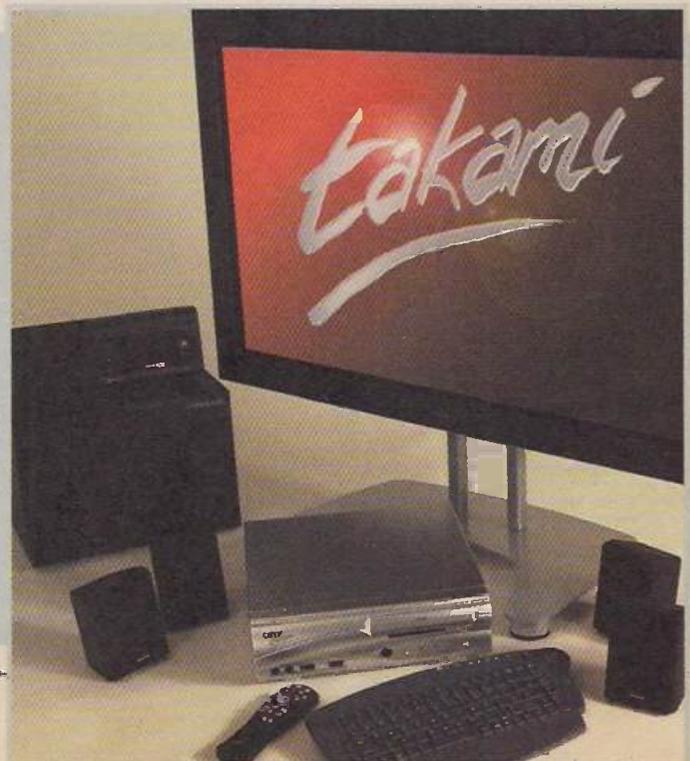
An article in our June issue (page 466) described the WorldSpace digital satellite radio service in some detail. The company has now set up a UK subsidiary, WorldSpace UK Ltd., at 4-6 Soho Square, London W1D 3PZ. Phone number is 020 7494 8200, fax 020 7494 8201, e-mail UKService@worldspace.com

This should ensure that receivers are more widely available in the UK. There's a web site at: www.worldspace.com

Tiny Computers has launched a digital home entertainment system called Takami (see photo), the aim being to achieve a new level of convergence with home cinema and other entertainment. It uses NEC's new PlasmaSync 42MP2 plasma screen for the display. Features include video recording; hi-fi with juke box, CD and DVD players; a PC; games facilities; MP3 operation; internet and e-mail provision. Most facilities are integrated into a single silver base unit. A wireless keyboard and RC handset provide control.

For ease of selection, the TV can display all channels simultaneously. Video recording, which is fully programmable, uses the juke box for storage, eliminating the need for tape. Music downloaded from the internet can be recorded using the MP3 facility.

The PC function provides internet access and e-mail facilities, with USB ports for connection to a printer, web camera and gamepad as required. Takami is Japanese for "excellent idea". The system will set you back however, the price being in the £7,000 region. For further details contact Tiny Computers, Redhill Business Park, Bonehurst Road, Salfords, Redhill, Surrey RH1 5YB. Phone number 01293 821 333, fax 01293 782 663.



Did I ever tell you about my time working for John James? I'm not sure that he noticed me though. He was the Bristol chap who, like so many others after the war, found himself demobbed – from the RAF – without a job to go to. But he had his bit of demob money and noticed that, because few wireless sets had been made for the domestic market since the war began, there was a market for almost any radio receiver that worked. Then he came across one that didn't. So he tinkered with it and brought it back to life, then easily sold it at a profit.

A natural entrepreneur

John was a live wire. He found another dead receiver, then another, and made them work, selling them on at a decent profit. Before long he had a good little business going. He then opened a shop at Broadmead in Bristol, and called it the Broadmead Wireless Company. It did well. So well in fact that he began thinking about opening another shop.

He was an ordinary, decent chap with no airs or graces, and he enjoyed a drink at his local pub. When, one night, he fell into conversation with a personable chap there, he decided that this was just the fellow to run his next shop.

That did well too, and he opened another, and then another. And when the radio factories were released from their government contracts and started to produce sets for the home market, John was there to negotiate special terms for his growing group of shops. He was more successful with the smaller manufacturers than the top agency ones in this respect. He drove hard bargains, paid his bills on time, and came to be respected in the trade for his straight talking, reasonable attitude and general lack of 'edge'.

Here was a man taking his self-made company to the status of a multiple. I began working for him, as a van driver with the title Outside Engineer, at his first branch outside the Bristol area. By then television had arrived.

Broadmead days

I had previously worked for another multiple, the then successful J & M Stone group, as their only bench engineer at the branch concerned. My workshop was at the back of the showroom, a tiny stone-floored den about the size of the average outside lavatory in those days. Only it didn't have a window. It was there that I obtained my guaranteed lifelong freedom from rheumatism, through severe and repeated mains shocks to earth.

The difference between conditions at Stones and Broadmeads was astonishing. The Broadmeads shop was large, and its workshop was a huge, airy south-facing area above the showroom. The service manager ran it as he wanted to, and everything he ordered from Bristol came without a quibble. There were three of us on the servicing side, and I spent the happiest few years of my life there. Each day brought much good-natured

WHAT A LIFE

The start of Broadmead, and some characters Don Bullock met during his years working for the firm. Reflections on the abysmal state of TV today

humour. The customers were the butt of most of it, as of course was only right!

John James chose his area managers by his own yardstick – their decency and personality rather than any qualifications they might have. They chose their shop managers, who each chose their staff. All in the same way. Some of the characters who came and went at our branch provided a right comedy show. We watched them with wry amusement from our lair upstairs.

Porkence

We called one of our managers, who had a sort of piggy look in his colouring and size, Porkence. Unfair, but that's the way we were.

When a likely customer came in, Porkence would frown as though to appear serious and try to grin at the same time. He would address them in a rather peculiar manner.

"Hello, sir" he'd say, "can I 'elp you sir. I mean, was there somethink?"

This apparent humility would put customer at ease and make him feel a bit superior. Customers liked this and warmed to Porkence. He sold a lot of sets to a lot of people, some of whom had come in only for a battery.

He seemed to want to establish a personality of his own, but never quite managed it. He found the next best thing when, one day, a cruel blow came.

It was a bright, sunny morning. When I arrived I saw that the shop was completely empty. There was nothing in the windows or on the shelves. It had been cleared of its scores of sets and looked as if whoever had done the deed had swept the floor as well. A few CID men were poking about inside. And Humphrey Bogart was leaning by the doorway, in the arcade, dressed in his trilby

hat and white raincoat. He had a cigarette in his mouth, and the smoke curled up past his eyes. I looked twice. No, it wasn't Humphrey Bogart – it was Porkence.

"Don't touch a thing, Don" said Bogart's deep and husky voice from the corner of Porkence's mouth. "The joint's been cased."

By this time I'd seen a few American films and knew what he meant. Robbed. Shortly afterwards the two lady shop assistants arrived.

"Don't you dames touch a thing" he said. "the heavy guys have given us a call."

Once the police had gone he jumped into the firm's big van and drove to Bristol for some stock. There was no paperwork. Just sets. I never knew whether the robbers were caught, or the sets recovered.

The smaller branch

Then there was Roger, who was both manager and the complete staff at our smaller branch a few hundred yards away. He was a nice fellow, who lived a long way off, up in the hills. But he had one unfortunate habit.

He would sometimes close the shop and go home, leaving his display of radiograms and sets in the arcade. Night patrol police would have to get him to come and put them all away safely.

Spelling

The problem with Albie, who worked at our branch for a few months, was that he wasn't very good at spelling. Trying to interpret his job cards from somewhere within the Forest of Dean could be tricky.

"Mustr ovwundeeples latidin" was one address that fooled me. So did the details of the job, "rajgrum/argiday novollumded". I thought about this for a while, then went into a pub to find a telephone and some tonic. The landlord looked like a ram pushed into an old suit.

"Worseewann?" he asked me.

I pointed to the beer pump, put my palms together, one over the other, and raised my top hand.

He picked up a pint mug and filled it. After paying I took it over to the phone. Roger answered.

"I'm in the Forest, Roger, and I can't read Albie's job card."

"I'll put him on" Roger replied.

"No, don't do that, I don't feel up to it. Just ask him what 'mustr ovwundeeples latidin' means, would you?"

He spoke to Albie, then came back.

"He says it means what it says" Roger said, stifling a laugh. "Mr Hough, 1 Dee Place, Littledean."

"Ah, of course" I replied. "silly me. Now tell me something else. About the fault details. It says 'rajgrum/argiday novollomded'. What's that, Roger?"

Roger went off, and I heard raised voices. Then he came back.

"You've got him properly upset now Don. Wants to know why a chap of your age can't read. Thinks you're trying to be

funny."

"All right Roger, but what does it mean?"

"Radiogram, RGD. No volume, dead"

Roger replied.

"Ah yes, of course., See you later Roger."

Sense of humour

Roger had a wicked sense of humour. He'd often describe customers in words that would come back to me when I met them. This could be embarrassing. I might find it hard to suppress my laughter when I was supposed to be engaged in a serious conversation. Some of them probably thought I was mental. After all, when a customer's television failed in those days it was on a par with a family death.

There was only monochrome TV at the time when Mrs Stanley used to phone the shop. "There's been a call from Mrs Stanley, 8 Rowland Lane" Roger said to me one day. "Lives alone. She has this 17in. Decca TV with VHF radio. Gets the pop into her during the evening. When TV shuts down at ten she pulls the plug out of the TV socket and puts it into the VHF radio one, so she can hear the Light Programme. In the morning she's no recollection of doing that and phones us to say her set won't work. Just call round, pull the plug out of the VHF socket and put it in the TV socket. Then charge her twelve and six."

I made to go "Oh, one other thing" Roger added, "Rowland Lane was in two bits until they joined them with the little shops, and there are two number eights. Mrs Stanley's is the one on the left. You can't miss her. She's a thin old cuss. When you start to talk to her she stretches her neck and moves her head around in little circles. Like an ostrich. You'll see."

I called and she did exactly as Roger had said. I laughed uncontrollably and she reported me to Roger.

"Fancy laughing in a poor old lady's face" he said.

Home demonstrations

One day Porkence had agreed to give Mr Devus a home demonstration of a 23in. set and the latest, biggest and best Grundig tape recorder we had in the shop. I can still remember it - a Model TK830-3D. It took 7in. spools and, after recording to the end of the tape, reversed direction and recorded a second track. It was the one I would use in the lunch hour to tape the new Sinatra albums.

"It's the big house up the long drive on the outskirts of town" Devus had said. "You can't miss it. The hedge is all overgrown on to the pavement. My wife's been on to me to cut it back... When will you be calling? Shall we say a quarter past six?"

"I'll call on my way home" Porkence had replied, "I pass your place."

When Porkence arrived he found Mr Devus in his shirt sleeves, snipping at the hedge with a pair of shears.

"Bang on time" Devus said, looking at his watch. Then he waved the shears and grinned. "Missus got on to me again. Won't take me long though."

He put the shears down and helped Porkence get the TV and recorder out of the van. "Let's put them in here by the drive" he continued, "I'll take them in and set them up in a minute or two. I know they are what we want, and will pop along in the morning to pay. Cheque all right?"

The morning came, but Devus didn't. After waiting patiently until teatime, Porkence decided to return to the house. The occupant was a regal old lady who lived alone.

"A sound recorder? What's a sound recorder?" she asked. "No, I don't bother with television. If I wanted a set I'd go to Cavendish House for one, Goodbye."

were all properly introduced by presentable and well spoken people who treated their few viewers with respect. Then ITV began. The BBC tended to treat it with disdain, because of its informality, matey presentation and banal programmes. Soon however the viewing figures went against the BBC, which reacted by lowering its standards. Thus the decline began. It seems too late to be able to do anything about it now. Television can, I reckon, only get worse.

Take the digital transmissions. I tend to turn to the BBC 24-hours programme for the news. But the hullabaloo - the pumping musical racket - that accompanies the opening news headlines is sickening. So too are the imitation advertising slots, particularly the miscellany of past news headlines. It's sometimes so bad that I am driven to ITV news, which is admirably presented though blighted by the adverts.

Well, that's better. And won't those letters flow!

When in Spain I like to listen to the



A few CID men were poking about inside. And Humphrey Bogart was leaning by the doorway

As Porkence departed he looked at the hedge. Apart from the few bits that had been snipped off when he'd first called, it hadn't been touched.

State of TV

I was reflecting the other day on the excellent technical quality of today's TV pictures and the abysmal quality of so many of the programmes. It seems to me that the trouble is too much television. Too many channels, all struggling to fill too many hours a day.

When television restarted after the war there was only the one BBC channel. While some of the programmes were boring, they

Home Service (which the whiz kids insist on calling Radio 4) when I wake up early. This was all right via analogue satellite transmission. Our Pace receiver remained tuned through the frequent short power cuts. But we had to go over to digital, which is not all right. The briefest night-time power cut detunes our Panasonic receiver, and I wake up to BBC News 24 sound. That's sheer hell to wake up to. I have to clamher out of bed to retune the receiver. As it gives no indication of which channel it is delivering, I have to search for the remote-control unit, turn on the TV set and run through all the horrible programmes until I get the radio channel I want. I don't want to see any TV in the morning - nor daytime.

Progress! What a life! But, as yet, the digitally-transmitted BBC Knowledge is a shining light in the desert. How long will it maintain its high standards? ■

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1427T	PSU	ONWAKIT	JVC			CT28AV1BDS	PSU	MITSKIT3	MAKE	KIT TYPE	CODE	
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1458T	PSU	ONWAKIT	AV29SX1EN1	FIELD OUTPUT KIT	JVCKIT1	CT29A6	TDA 8178S	MITSKIT2	D-16 CHASSIS	SOPS	PHILKIT6	
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2002	PSU	ONWAKIT	C14E1EK	PSU	ONWAKIT	CT29B6	TDA 8178S	MITSKIT2	KSM VIDEO	SOPS	PHILKIT9	
2009B	PSU	ONWAKIT	C14T1EK	PSU	ONWAKIT	CT29B6	TDA 8178S	MITSKIT2	LSM VIDEO	SOPS	PHILKIT7	
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CT2159U	PSU	ONWAKIT	21V1T (MJF18004)	PSU	GRUNDIGKIT3	TC28XD60	VERTICAL O/P IC	PANKIT2	SHARP			
CT2863UNT	PSU	ONWAKIT	21V1N (MJF18004)	PSU	GRUNDIGKIT3	TX28XD70	VERTICAL O/P IC	PANKIT2	51CS03H	POWER / LINE	SHARPKIT1	
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Intelligent homes

The home of the future is likely to be full of equipment linked via a domestic network bus to a central unit that provides overall control. This could involve a lot of installation and maintenance work. Mark Paul provides an overview of the current situation and the prospects

When a home is automated, electronic devices can take command of operations with little or no human intervention. Automated lights and CD players can, for example, switch on at a preset time to coincide with your return from work, or whenever you disarm the security system. Automated heating/cooling systems can raise or lower the temperature of a room whenever someone enters. Automating your coffee maker, radio and towel warmer so that they switch on when your alarm clock goes off can ease your initial steps in the morning. Virtually any electrical/electronic device, and any personal routine, can be automated so that less time is spent fidgeting with the little things in your house, giving you more time to get on with more important matters and enjoy life.

The heart of a home automation system is of course a central processing unit (CPU), which can exchange information with the various items linked to the system. The CPU receives cues from external devices, or from various conditions that are monitored, such as the time of day or the temperature at various points, and responds by transmitting appropriate control signals. If, for example, an occupancy sensor linked to the CPU detects motion in the front hallway, the CPU may give instructions to turn on the hallway lights or increase the heat in the house.

But you wouldn't want a home automation system to take over completely, second-guessing your every wish and maybe getting it wrong. Members of the household can take over control via various user interfaces –

keypads, touch-screens, panic buttons, computers, telephones, handheld remote-control units and even voice control. Someone in a romantic mood could say punch #3 on a cordless telephone's keypad, telling the system to activate the mock Italian fountain on the front lawn, put the patio lights on at a suitable level and send appropriate music drifting through the trees.

The network

Regardless of what you wish to automate, a common network is required to link the various items in the system together. The network can be hardwired, software, wireless or any combination of these. Most home-control networks are at present hardwired, with dedicated cabling to the CPU. It's generally considered to be the most reliable approach, but

requires ample cabling to be routed through the house. Hardwiring is thus generally an option only for new homes and major renovations.

In an existing home where it may be difficult to install dedicated wiring behind walls the electrical AC cabling can be used for the network. This technology, often referred to as powerline carrier (PLC) or X10, can for example enable a user to turn off the light in the living room from the master bedroom simply by plugging the light into an inexpensive module and addressing it using a plug-in keypad. A recent article (May) described the approach to being promoted by the HomePlug Powerline Alliance. There are also technologies that provide networking via domestic telephone wiring.

Wireless links do not use cable nor require line-of-sight yet provide communication and control from a distant location in the home. Infra-red communication uses a frequency just outside the lower end of the visible spectrum and thus conforms to the laws of light: this means that there must be a clear line-of-sight between the controller and the controlled device or sensor.

Naturally communication is digital, since this enables coded instructions to be received reliably. If you were to attempt to use mains cabling to send information in analogue form it would be impossible to guarantee a clean signal at the receiving end – the signal-to-noise ratio would simply be too great. Analogue noise superimposed on a digital signal can be chopped off electronically, while coding takes care of any errors that may occur.

Because electronic devices are made by a number of manufacturers it can be difficult to achieve intercommunication between different items in a network. Domestic systems designers/installers could spend months writing programming code to enable one sub-system, maybe for security, to communicate with another, say for heating/cooling. The domestic automation industry is attempting to establish common standards that simplify communication between various different systems and devices. Unfortunately there are at present many standards in existence across the world, using different protocols and hardware.

Cables

A house can be packed with the best electronic equipment available but, unless suitable wiring is installed, it will not be possible to make full use of the possible benefits. You might want to pipe music



Door-entry monitoring is a basic feature of the JR Smart home. The TV set automatically switches to display the input from a monitoring camera. There is provision for verbal communication, and in addition the security system can activate lights.

from the living-room CD player to satellite speakers around the house, provide a video link between the living room DVD player and a bedroom TV set, or network PCs and control systems. It all requires cabling. At least some housebuilders now offer pre-wiring as a standard amenity.

The common standard for communications has been Category 3, which is a twisted-pair (TP) that can handle ordinary telephone calls, fax transmissions and e-mail. But data moves slowly via this pipeline, at 10Mbits/sec. Net surfers will be all too aware of the limitations of Cat 3: downloading of information from the web is very slow, even with a fast modem.

For speedier net access, high-speed computer networking and use with advanced telecommunications equipment high-quality Category 5 TP is needed. This transfers data signals clearly and speedily at a rate of 100Mbits/sec. Web TVs and web-surfing telephones work adequately with Cat 3 but more efficiently with Cat 5.

Whatever the equipment, hardware or software, the need is for wide bandwidth. A word of explanation on this subject. A transmission line can be considered as a series of tuned circuits, which means that there are inductive and capacitive elements. As a result, there is a frequency/bandwidth limitation. Bandwidth is the

difference between the highest and lowest frequencies that a tuned circuit can handle. The wider the bandwidth, the greater the ability of a tuned circuit to be able to handle a wide frequency range without tilting of the frequency-response characteristic. Ideally, this characteristic should be flat, i.e. linear, over the frequency range. A non-linear response (tilting) means selective frequency delays, which distort the signal, in this case the data being transmitted.

Squarewaves (data pulses) can, by Fourier analysis, be considered as a number of sinewaves – a fundamental plus harmonics – added together. The circuit bandwidth has to be wide in order to be able to handle all these harmonics, providing a good transient response, i.e. ability to pass on a squarewave without distortion. With a poor transient response, pulses are delayed and become rounded. This means sluggish data transmission.

Coaxial cable is used for 'entertainment' purposes, i.e. transmitting video signals around the home. Standard RG59-rated coaxial cable is fine for feeding a signal to a single TV set, but where the requirement is to distribute the signal to several TV sets without loss of video quality RG6 does a better job. RG6 is also better able to handle home-DBS, HDTV, interactive systems etc. It has the ability to transmit a greater number of signals. Its bandwidth is about 1.5GHz, compared with the 600-900MHz of RG59.

The CPU

The CPU co-ordinates the actions of connected subsystems such as lighting, security, heating/cooling, entertainment etc. Pressing an away button might not only alert the security system but also set back the master thermostat and switch selected lighting on at various times. Pressing the home button does the reverse.

In a well-designed intelligent home the control system is very low-profile, the only physical hint of its existence being user interfaces such as keypads, touch-screens etc. which give user access to the CPU.

There are wide differences between various home automation systems. These relate to degree of intelligence, ease of programming, level of flexibility, integration of communications media, the range of customisation etc. – also of course cost.

Current technology

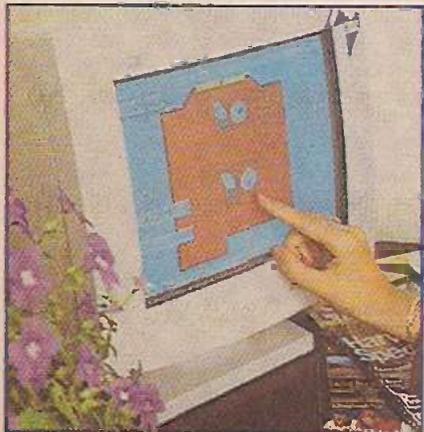
Much of the technology used for home electronic systems and building

automation is quite old. We all take for granted such things as automatic door opening on approach. What has advanced things is the ability to integrate systems and use computerised technology for control.

A control network involves nodes, each with one or more sensors or actuators and all linked to a central processor, using a standard protocol. There could be three, three hundred or, in something complex like an airliner using an automatic landing system, thirty thousand or more nodes. Communication between nodes, digital of course, may be peer-to-peer (distributed control) or master-slave (centralised control). In either case intelligence at the nodes permits a distribution of the processing load. Sensors in themselves can be intelligent, performing local data analysis, conversion and normalisation, being expected to report only significant changes in their environment. If the control functions are also distributed, system performance and reliability can be dramatically enhanced. A car for example may have several control networks that run independently but can address one or more of the others.

Although domestic equipment has become increasingly sophisticated, very often with microcontroller operation, the fact is that the technological infrastructure in the average home has remained relatively static. The various pieces of equipment scattered around in our homes could talk to each other but very rarely do. It's only recently that

There are two ways of operating the JR Smart home whole-house integrated system, by a touch-screen PC or a TV PC. This photograph shows touch-screen PC operation, a user-friendly approach that gives access to the whole system including the set-up and operational software.



networked equipment has come on to the market, with links to the internet.

Smart-homes technology

The phrase 'smart home' is used to describe housing in which information technology has been installed to control a variety of functions and provide communication with the outside world. Equipment manufacturers, systems installers and a few private individuals have, since the late Seventies, worked on the development of home automation systems employing low-cost computing. An early attempt was made by several manufacturers to get D²B established as a domestic bus system.

The Smart homes project was jointly funded by the Joseph Rowntree Foundation and Scottish Homes, with development and installation of the technology being undertaken by the Joseph Rowntree Housing Trust and Edinvar Housing Association. The aim was to bring together domestic automation systems in a user-friendly manner, with a focus on it being affordable in the social housing markets. Two model user-specification trial systems have been created for assessment. The equipment at both sites is based on technology developed for use in commercial buildings, and is therefore a bit cumbersome and over-engineered. But these aspects will change when the market develops.

The initial aim of the projects was to satisfy certain criteria: safe and easy to use, assisting independent activities in the home; cost-effective and replicable at low cost; reliable and sufficiently flexible to allow for future additions and adaptations; easy to install and maintain.

Prior to the start of the two projects there was consultation with various interested bodies, including the Building Research Establishment (BRE) and the European Intelligent Building Group (EIBG). As a result, additional criteria were added: safety, security and convenience in the control of household appliances; energy and environmental management; the needs of the elderly and those with disabilities; and suitability for adaptation to new forms of entertainment and business applications in the home.

Subsequent suggestions have been legion. The following provides an idea: door-entry systems; home security; domestic environment control; motorised window control; motorised door operation; central locking; cooker control with automatic detection for pans that are about to boil over; efficient heating and

ventilation management; automatic gas leakage sensing and shut off; automatic fire detection; video links for carers; memory joggers for those with mild forms of dementia; help-summoning techniques; links to remote-control centres; smart-card activation of systems for those with partial vision; and modem links to all functions.

This all led to a draft specification for smart homes. It has been developed at three levels: basic infrastructure; general functions; and additional functions. The basic infrastructure is intended to be appropriate for use in any type of housing: it forms a basis to which more specific technologies can be added. Level two relates to the basic functions required in particular types of housing, while level three brings in additional functions to meet the needs of individual occupants.

Each level has to satisfy a number of general conditions, in particular: the equipment/system must have clear, unambiguous functions; interfacing should be simple to operate; systems must be affordable with demonstrable benefits; reliability must be specified by manufacturers; systems must be programmable, able to accept add-ons and interface with other equipment; the basic infrastructure must be based on a long time scale, with capacity to upgrade at low cost and effort; wide interconnectivity that complies with accepted standards must be provided for interactive use; ease of installation with low visual impact is expected; and back-up maintenance should be available.

Personal considerations

The potential benefits are huge. There is a capital cost of course, but various savings offset this. To introduce such technology in our homes will, in comparison with the provision of basic entertainment, represent a quantum leap for domestic electronics.

Certain ethical questions arise, from privacy to telesurveillance that could affect independence. These should be controllable, while the benefits should be far more significant.

Standards

Devices that can interact must use a common language and comply with the same protocols. Standards are being developed to cover particular applications, with the language specified. Certain protocol standards are worth mention to fill out the details.

Communications link: Can be by mains

signalling; unscreened twisted pair; screened twisted pair; coaxial cable; optical fibre; infra-red radiation; wireless technology.

Link system characteristics: Digital transmission speed; suitable for audio, video and data; maximum length; expandability; need for repeaters; power requirements.

Compatibility with other protocols: Compatible with existing structured cabling systems and availability of gateways for interlinking systems.

Ease of installation: Cabling and power requirements; opportunities to use structured wiring; need for precautions to avoid interference and ensure safety.

Ease of commissioning: Method of setting device addresses, hardware and software; plug-and-play availability; user programming.

Ease of use: Quality of user interfaces.

Reliability and robustness: Immunity to electrical interference; use of error correction; hardware and software complexity; effect of heavy network traffic.

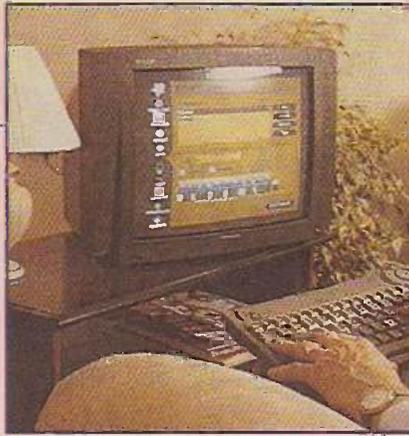
Security: Secure data transmission; suitability for use in safety-related applications, e.g. fire detection; data privacy.

Safety: Use of low voltages and restrictions on use in bathrooms and outdoors.

To provide a broader appreciation of smart-home technology, the two demonstration sites adopted different approaches: the US LONworks Echelon system was used for JRF while the Siemens Instabus EIB approach was adopted for Edinvar. Details of each installation are as follows.

The JRF Smart home

The design of the wiring and the compatibility of the equipment used is such that all systems and products can talk to and learn from each other as well as operate independently or simultaneously. The home occupier can set programmes tailored to his/her needs. The LONworks system (LON = local operational network) was designed by Echelon in Pala Alto, California. It's a multimedia open system using technology



The alternative, TV PC approach to JR Smart home control. The TV set becomes a PC with an infra-red remote-control keyboard. In addition to home network operation, this gives access to the internet with the TV screen for display.

that enables products to communicate with each other directly. The basis of this technology is the Neuron chip, which is produced for Echelon by Motorola and Toshiba. When it is incorporated in products they have sufficient intelligence to be able to communicate with each other. Communication can be by RF, twisted pair or via the existing mains cabling.

The following is a brief listing of the features incorporated in this home.

Lighting control: The household lighting can be operated manually, via the telephone line, by remote control or detection of body heat to switch on. The lights are also programmable, to provide a welcome when the owner returns, and all have a dimmer function. Lighting is linked to the doorbell to obviate hearing problems, and to the alarm system and fire alarm.

Heating control: Can operate manually, be programmed and operate remotely by telephone or IR. The roomstat and heat detector are combined with a smoke detector.

Power outlets: Each power outlet can be operated manually, by timer, by remote control or by IR, for example the CD player can be activated to enter the play mode by a sensor that detects someone entering the room. Remote access provides ability to switch on an electric blanket or lamp in the bedroom from say the living room or kitchen.

Taps: Can be controlled in the normal way or by hot and cold buttons on touch pads. They can be operated by IR detection or remotely, e.g. a bath can be drawn without leaving the living room or

by telephone while on the way home.

Door entry: When a caller arrives and rings the bell, the lights can be set to flash on and off and/or the TV set will respond by overriding whatever programme is being received to display the picture from a monitor at the door. If the TV set is in the standby mode, doorbell activation will power it up to display the CCTV picture. The resident can talk to the caller from his armchair via the TV remote-control unit.

Security: The home security system confirms the status of the exits, doors and windows. Passive IR sensors, which are combined with a smoke alarm to minimise their visual impact, monitor for intruders and link to flashing lights as well as giving an audible alarm. The security system can be programmed, e.g. a holiday setting provides periodic and random light switching on and off to give the impression of house occupation. It can also be linked to warden call alarm systems.

Central locking: Linked to the security system. The key is replaced by a fob, similar in many ways to a car immobiliser key. When placed against the alarm panel, the fob locks all doors and windows.

Electric windows: As in a car. Can be manually operated, programmed, set on a timer, operated by IR and via the telephone.

Curtains/blinds: Can be operated manually using a simple switch, by IR, activated by daylight/darkness, be programmable, or be operated via the telephone line.

Doors: To all rooms can be operated manually by a simple switch, by IR, programmable or by telephone-line operation.

Gas shut-off: If there is a gas leak or a cooker flame blows out by accident a gas-detection system shuts off the supply to the whole house.

Access to the whole house integrated system for master control is via either a modified standard TV set, a PC or a touch-screen PC. The latter is highly user-friendly, being menu-driven in simple terms. For setting up there is access to the complete system on a room-by-room basis. The modified standard TV set becomes a PC with IR remote control. Internet access is provided for shopping,

operation of the home network, lighting, power to equipment, caller monitoring, etc.

The Edinvar Smart home

The Edinvar Housing Association adopted modern technology to create barrier-free housing for the elderly or disabled. The Edinvar demonstration Smart home is called the AID house (Assisted Interactive Dwelling house). Its main aim is to avoid the need for hospitalisation or institutional care. Discreet movement monitoring in the home helps achieve independence, with wardens on call 24 hours a day from a manned local resource centre. This has audio and video links to the home, with a terminal for monitoring the occupant's movements, e.g. by pressure pads under the carpets, IR detectors etc.

The building management system is based on Siemens Instabus EIB, which enables the user to control and monitor a combination of systems that use a common communications network. Achieving such control with a conventional electrical installation would mean that each function requires its own cable and each control system its own network. Such an arrangement would obviously be time consuming, disruptive and very expensive. In addition a single-line communication link provides a claimed thirty per cent saving in copper, with of course a reduced fire load.

EIB background

In 1990 Siemens got together with other leading European electrical product and systems manufacturers to establish a standard interface, thus providing a common interface so that their products could communicate with each other. The European Installation Bus (EIB) was launched, making possible innovative applications and systems for the control and integration of building services. Instabus EIB is Siemens own EIB product range. An additional range of over four thousand products from over eighty other EIB member manufacturers is available however, each product being guaranteed to provide communication with the others.

All such products are independently tested, being certified through approval by the European Installation Bus Association. This is the central governing body that oversees the activities of its members and promotes EIB worldwide. Commonality means that manufacturers can concentrate on their own areas of expertise, with the

designer/installer simply mixing and matching the most appropriate products and services to produce a customised system. The technology is 'open', giving maximum flexibility, and because of the modular nature of the approach a basic system can easily be extended to include additional features and/or products at a later date.

The Instabus EIB system

Instabus EIB is an event-driven rather than a PC-based system. Central control and monitoring are possible however if required, through visualisation software. It operates via a bus line. Sensors and actuators, referred to as bus devices, are linked to the 24V bus line via a bus-coupling unit. Each individual device has built-in intelligence, enabling it to transfer information to and effect exchanges with every other bus device. Sensors function as control, monitoring and signalling devices, e.g. PIR detectors, switches and thermostats. Actuators receive information and perform actions. Once connected, all devices can exchange data in serial form in accordance with the bus protocol.

For such a system to work, all the sensors and actuators need a physical address, with commissioning and programming configurations to decide which sensors communicate with which actuators. The modular nature of the system facilitates modification and expansion, with a single system having an addressing capacity able to accommodate over 11,000 devices. For Instabus, the address hierarchy is: 64 bus devices form a line; 12 lines combine to form a functional zone; 15 zones combine to form an overall system. Any sensor, whatever its address, can communicate with any actuator.

This addressable system makes commissioning, programming and any subsequent need to reprogram or expand the system simple. It also makes for easy maintenance.

Features of the Edinvar house

These are similar to those provided by the JRF Smart home and include the following: door-opening mechanisms, including electric locking, keyless door and remote control; window-opening mechanisms; individual lighting controls, with automatic operation as required; a loop-induction amplifier for the hard of hearing; curtain-opening mechanisms; contacts on windows and doors for activity monitoring; pressure pads for activity monitoring and lighting



Each power outlet in the JR Smart home can be controlled in several ways. This photo shows remote-control operation, which enables the user to send commands to any networked equipment via the power outlet.

control; a video entry-phone unit; IR bathroom controls for shower, taps and flushing; motorised radiator valves and heating thermostats; PIR movement detectors; heat/smoke detectors, able to interact with other equipment in an emergency, unlocking/opening doors, switching extractor fans, cutting off gas/electricity supplies to appliances; fridge/freezer defrost alarm; twilight detectors that control curtains; PIR-operated external lights; audible reminders; timer control of water flow to prevent flooding; thermostatic control of bathroom water to reduce risk of scalding; toilet flush; possum disabled interface, which uses touch-screen technology or an alternative such as blow tubes or push pads for the severely disabled; touch-screen interface to enable key devices to be controlled simply by pressing a picture on a monitor screen; pull-cord emergency alarm or personal pendant; remote monitoring by a local resource centre; gas-leakage detector that operates an alarm, shuts off the gas supply and switches on an extraction fan; and a central system that gives a further level of control.

In conclusion

Such systems are becoming cheaper to implement and are a logical, natural step forward in domestic electrical/electronics technology. We shall have to see how they evolve. Simple systems will obviously be adopted first – most homes will probably never need the 'full works'. All this will certainly provide more and interesting work, both in installation and maintenance. There's a big market waiting to be exploited. ■

DIY TV repair, 1957

How things have changed! Eugene Trundle discovers a book on TV repairs published just 45 years ago

While on holiday in Toronto this spring I happened to be browsing through a second-hand bookshop when I came across a real treasure: the 1957 edition of *TV Repair Guide – Do It Yourself!* by Edward A. Campbell, I.R.E., A.E.S., published by Harris Press, New York. I paid \$2 for it and had my £1's worth just seeing the face of the salesman when I asked him if he thought it would help me fix the TV set in my hotel room (bad picture), and where could I buy a screwdriver locally? This paperback book certainly provided more interest than Canadian TV programmes, but that's another story . . .

Basic repairs

The American TV scene in the mid Fifties involved high prices (in real terms), poor reliability and a preoccupation with antennas and tubes – big curvy picture tubes with a typical lifespan of two-four years, and little ones (valves) which, according to this book anyway, were user-replaceable. Indeed much of the book deals with changing valves and fuses, by which means it appears that two-thirds of TV troubles could be cured. Happy days, but heaven help you if you took out all the valves and got them mixed up!

The first chapter, *The Inside Dope On Your TV Set*, starts off with a grave warning about random twiddling of 'adjusters'. It goes on to describe the internal layout of a typical TV set and the effects of all the knobs and tweakers. Chapter two, *What Makes Your TV Tick*, provides a thorough run-down on valves, whose average life is quoted as "at least a year or two". A typical 1956 monochrome set had 24 valves, but only 14 different types. So there was some scope for swapping 6AL5s and 6SN7s between the various functions in the set – a valve that was too tired to oscillate nicely at line rate might do duty for a while as the vertical sync amplifier! There follows a description of picture tubes and then the new solid-state devices: selenium rectifiers, germanium diodes, and transistors, which by that stage had started to be used in hearing aids and portable radios.

Chapter three gets down to diagnosis and repair, including replacing picture tubes, but goes no farther than swapping glassware. Beware of unbranded tubes, it says. You were OK with RCA, GE, Sylvania, Raytheon and DuMont, names which are mostly distant memories now, along with the Philco, Emerson and Winguard sets they went into.

There's a long chapter on antennas and picture impairments caused by bad reception conditions. In those days most TV broadcasting was at VHF, but there were UHF transmissions in the USA from 1952 – predating ours in the UK by twelve years. The trouble they had in fringe areas! It was not uncommon to have a reception tower on or near the house: some of them rose to 100ft. Interference of various sorts was rife, meriting a chapter to itself. Our own aerial and interference expert Bill Wright would have enjoyed himself in Oklahoma or New York in the mid-Fifties!

The yellowing pages of chapter seven, *TV Trouble Clinic*, feature the "top 29" picture faults of those days, with a clown variously stretched, snowed upon, juddering, misty

and interfered with. My favourite, being a country boy, is a picture of a *small* clown, caused by "fluctuations in house-line voltage – install a voltage regulator or ballast". How they suffered!

Colour

Colour TV broadcasting started in the USA in 1954, but by the beginning of 1957 had reached a household penetration of only one per cent. The sets cost about \$850, equivalent to perhaps several thousand pounds in today's terms. And what monsters the receivers were by modern standards! More than 2,000 separate parts went into a typical 1957 colour set, including the circular-screen shadowmask tube. There were typically 13 operative (user) controls and about 29 internal presets. The author comments that he "has yet to see a colour demonstration with several sets in which any two of them produced identical colour hues at the same time". The NTSC (Never Twice the Same Colour!) system contributed to the problem, but there were many other factors.

A fascinating add-on unit, COL-R-TEL, was offered by Color Converter Inc. of Columbia City, Indiana. It consisted of a seven-valve collection of electronics that drove a motor and 30in. tri-colour wheel. You put it on top of your monochrome telly set when a colour programme was scheduled. It had about ten connections to the TV set, to synchronise the wheel and "strobe" the tube. The resultant picture must have been very flickery, but the unit sold for \$180 – much less than a real colour set.

The book is unequivocal about user-servicing: don't mess with your colour TV receiver! In view of the reliability provided by these sets, a good colour TV technician must have done pretty well. In fact the book says that most colour sets were sold with a compulsory service contract, for which the buyer paid extra.

Servicemen

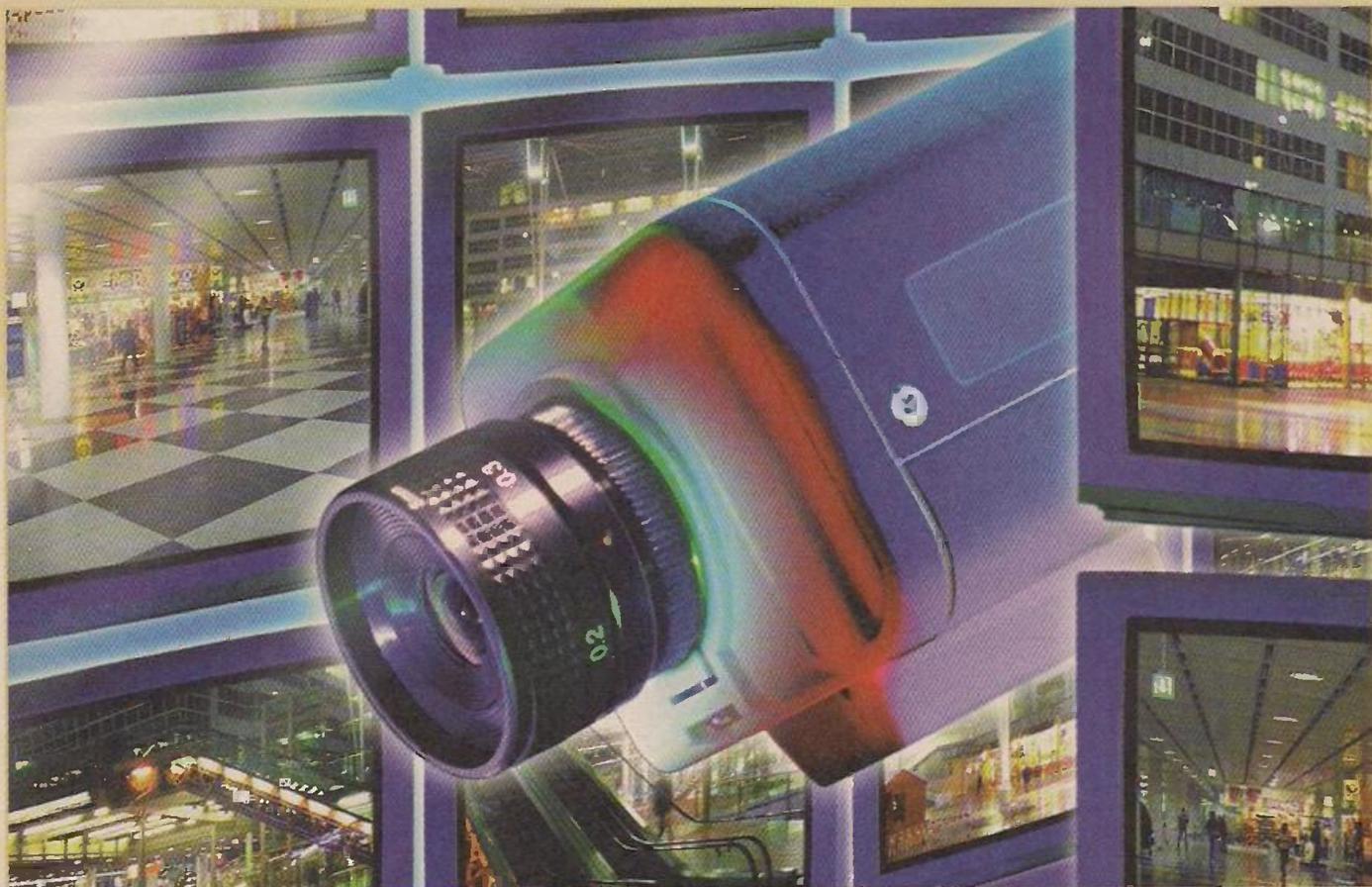
Mention of professional technicians brings us to the last chapter, *How To Deal With TV Servicemen*. My wife was particularly interested in this but, alas for Anne, it confines itself to professional dealings. We're told that the most valuable thing you can buy from a serviceman is his know-how. The bill for replacing a ten-cent resistor could amount to several dollars: when collection and delivery were involved, the punter of 1957 might have had to cough up some \$10 to get his set back into good shape.

As a concluding step, Edward Campbell quotes some contemporary repair charges. Picking one out at random, a resistor or 'condenser' replacement cost \$4.30, about one half of one per cent of the cost of the set. Translated into today's prices, that would value the repair at about £1.50, or alternatively the cost of the set new at £8,000. Wow!

Conclusion

It's a fascinating read that shows how much things have changed in four and a half decades. Normally at this point in a review we mention product availability: not this time! ■

A black-level stabiliser for



The October 1988 issue of *Television* contained an article of mine entitled "Simple CCTV Monitor Conversion". It described how to modify small monochrome TV sets for use as monitors in CCTV systems. The modification involved breaking into the video circuit at a suitable point, then fitting a video input socket and selector switch.

The black-level problem

Unfortunately many of the small monochrome portables produced in the past employ AC coupling between the video output stage and the CRT. Because

of this, the black level of the display depends on picture content. The result is poor pictures. With an average brightness setting, dark scenes are too light and look milky, while the dark tones in bright scenes are driven completely to black.

This article describes what I believe to be a universal "fits 'em all" modification to restore the correct black level.

The solution

Fig. 1 shows a typical AC-coupled CRT drive circuit. The brightness control VR1 provides DC bias at the tube's cathode, which is driven by the negative-going video waveform at the collector of the video output transistor Tr1, with C1 for coupling. With any given scene, the video waveform at the tube's cathode will settle so that the areas above and below the bias level are equal. The result is an unstable black level, since it becomes a varying point in the waveform, determined by the amplitude of the picture information. Note that the amplitude of the transmitted

sync pulses is constant.

In an effort to make the picture more acceptable, line flyback blanking is often employed. In Fig. 1 this is applied by feeding positive-going flyback pulses to the emitter of the video output transistor. These pulses are normally obtained from the line output transformer, and in this circuit will be attenuated to an appropriate level by R5 and R6.

The modification is shown in Fig. 2. It's not a true black-level clamp. Instead, it clamps the sync-pulse tips. But, since the amplitude of the sync pulses remains constant, it follows that the black level will also be constant.

The brightness control sets the DC level at the cathode of clamp diode D1. Emitter-follower Tr2, whose base is connected to the slider of VR1, is included to ensure that D1's cathode is connected to a low impedance, so that variations in the current via the diode do not affect the clamp voltage significantly. A small bleed current via R3 maintains

Components required

- R3 470k Ω , 0.3W
- R4 Select on test - see text
- C2 1 μ F, 100V aluminium electrolytic
- D1 1N4148
- Tr2 2N5401

monochrome portables

Keith Cummins describes a simple, effective circuit that can be added to stabilise the black level of the video drive to a monochrome CRT where AC coupling is used

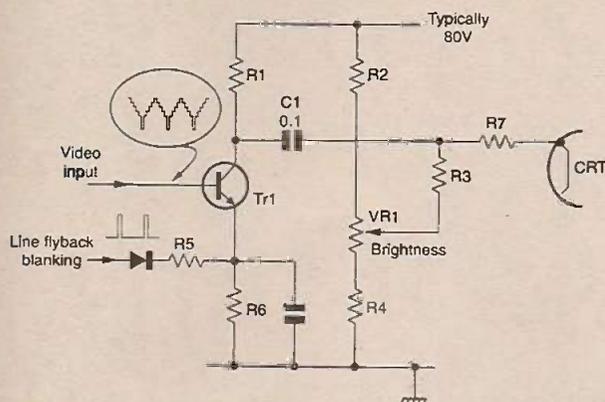


Fig. 1: Typical AC-coupled video output stage used in a monochrome portable. R7 provides flashover protection.

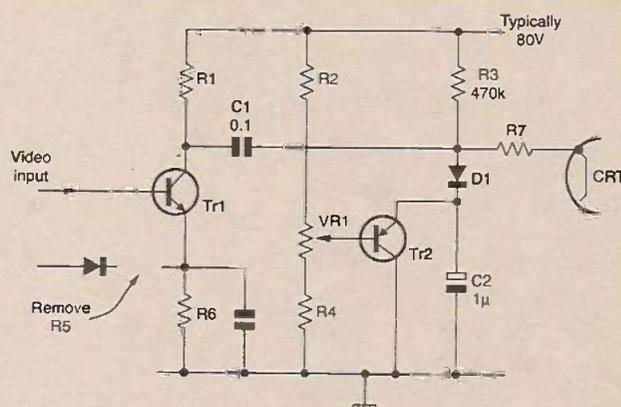


Fig. 2: Modification to re-establish a constant black level.

'pull-up' for the circuit when the beam current is zero.

The video signal, coupled via C1, has positive-going sync pulses which are clamped by D1, so that the entire video waveform is negative-going with respect to the D1's cathode voltage. D1 conducts during the 4.7µsec line sync period only. During the rest of the 64µsec line scan period the tube beam current charges C1. This does not affect the picture however because the value of C1 is relatively large while the beam current is very small, typically 50µA. When D1 conducts, any charge accumulated during the forward scan is fed to C2/Tr2, finding its way to chassis. C2 is included as a 'bucket', to help absorb the current pulses via D1. Current can then be dispersed via Tr2

over a longer period. This gives improved clamping, because the only significant impedance in the clamping path is D1's forward resistance. With a bright picture the current via D1 when it conducts is approximately 0.75mA.

Application

This modification means that the video waveform is all negative-going with respect to the voltage at the slider of the brightness control. Because of this, the brightness control range will need to be altered by increasing the value of R4, or fitting a resistor in this position if there isn't one there already.

If line flyback blanking pulses are applied to the video output stage they must be disconnected, for example by

removing R5 in Fig. 1. The large positive-going pulses, which have no relevance to the true video signal, would prevent correct operation of the clamp. Since the black level is now reproduced correctly, there is no requirement for line flyback blanking.

Note that, unlike an active black-level clamp, this DC-restoration circuit requires brightness control resetting should the contrast be adjusted. Once the controls have been set correctly however there is no need to keep readjusting them.

Finally, when the modified receiver is used as a monitor it's worth fitting an 'on' indicator LED. Otherwise the screen will be blank in the absence of a video input and it will look as if the receiver is turned off. ■

Make sure of your copy of *Television*

It can be difficult finding a copy of *Television* at local newsagents. The number of magazines being published keeps increasing, which means that newsagents have less shelf space for the display of individual titles. Specialist magazines in particular get crowded out.

There's a solution to the problem. Most newsagents provide "shop-save" and/or home-delivery services. There's no charge for a shop save. You simply ask your newsagent to order a copy for you: it will be kept on one

side each month ready for you to collect. Home-delivered copies are ordered in the same way, but generally incur a delivery charge.

A newsagent can order any magazine for you, whether or not the shop normally stocks it.

If you buy your copies of *Television* from a newsagent and want to make sure you get every issue, just ask at the counter.



Installing car alarms and immobilisers

Tom Baker describes more car/motor-home work that can provide you with extra income

In the last two articles I've tried to show you how easy it is to fit radios and amplifiers in cars and caravans. This time I hope to prove that if you can cope with those you are ready to take the next step in car electrics/electronics installation work.

As previously mentioned, I am still

a practising TV engineer, and really enjoy the work. Perhaps one day I'll be good at it! But I also find it fascinating to strip down the interior of someone's vehicle to install an alarm or immobiliser.

The key to this type of work is confidence in yourself and your abilities. Your customer wouldn't, after all, want to leave his new motor in the hands of someone who gives the impression that he's afraid to touch it. On the other hand, you don't want to give him the idea that the moment his back is turned you'll rip his car to bits, irrespective of whether you can put it all together again. No. The important thing is confidence, not over-confidence.

Insurance

Most car owners who ask about having an alarm or immobiliser fitted

will start the conversation with the question "is it insurance approved?" This is less easy to answer than to ask. If you have an alarm fitted, most insurance companies will give you a discount on your premium. You'll get a bigger discount if you have a "category 1" alarm fitted. It qualifies as category 1 if it's Thatcham approved. But there's a catch here. Thatcham approval costs the alarm companies money. This affects the price of their products, so less are sold. The alarm companies therefore prefer not to pay. This doesn't mean that their products don't conform to Thatcham standards. It's just that they won't pay for certification, thereby missing out on some possible sales.

On the odd occasion when the insurance company insists on a category 1, Thatcham approved

alarm, it's probably best to say that you don't have any and direct the enquirer to a main dealer, particularly as the insurance company will insist on receiving a certificate after fitting.

What's required?

To get back to basics, before you fit an alarm or immobiliser you must find out from your customer exactly what he wants it to do. Does he want it to operate the central locking, or close the windows, when it operates? Does he want motion detectors, or ultrasonic detectors inside the cabin, or microwave detectors? It's important to find out beforehand, as these extra add-on interfaces cost money. You must point out to your customer that these are extra, and that because his friend has an alarm which does all these things it doesn't mean that the one you might fit does.

How and where

Now to get down to it: how to fit the alarm and where. You will have to work this out for yourself. But here's some advice, based on a lot of experience. First, plan it out before you start pulling the interior to bits. It's nevertheless inevitable that you will remove something you don't need to. Replace it quickly, so that you don't end up with too many bits and pieces lying about. You'll thank me for that wise tip one day.

Next, look under the bonnet for a suitable place to put the siren/horn. The points to bear in mind are that it shouldn't get too wet or hot, or be in such a place that it produces a muffled sound when it goes off – that would defeat the object of having an alarm.

I've fitted many alarms and immobilisers to cars and motor-homes. My favourite to work on is the motor-home, because I like to have plenty of space around me when carrying out an installation. But this doesn't mean that motor-homes are always the easiest vehicles for which to provide an alarm because, sometimes, the customer wants microwave coverage as well as door and bonnet coverage – and ultrasonics and motion detectors to boot.

So, take a good look around inside the cabin area. Also have a good feel underneath and around the dashboard area for space to fit the alarm box and wiring.

I always fit alarms and immobilisers inside a vehicle's cabin. There are three reasons for this. First, the potential thief can't find it if he lifts the bonnet. Secondly, if he tries to start the vehicle he will have to

spend a lot more time inside it looking for the alarm unit, thereby increasing his chances of being caught. Thirdly, sensitive electronics in a plastic case don't readily mix with high-pressure steam hoses should your customer decide to have his engine degreased. So I never fit one underneath the bonnet. Remember that fitting an alarm will, when done properly and carefully, always take you longer than it will John Wayne, the local cowboy.

Fitting

The alarms I've fitted have all come with basic, easily-understood instructions which normally have pictures as well. Once you have unpacked the alarm, it's important to check that you have everything you require to do the job. I'm sure that I'm not the only installer to have made a start and found, subsequently, that a crucial item is missing. You then have to stop, and have the problem of explaining to the customer why he has to leave his vehicle with you for an extra day.

Once you have removed the relevant bits of trim from beneath the dashboard, and maybe the kick panel by the footwell, you can look for a way through to the engine compartment for the wire loom between the horn/siren and the main alarm unit. Be careful not to make this connection via a hole with a bare metal edge, as this may chafe the wire and result in a short-circuit, rendering the alarm useless.

Then look inside the cabin for an area to which you can screw the unit. Make sure that you won't be drilling through a cable or pipe. It's possible to tie-wrap the alarm unit to something that's fixed, say another metal box or something solid such as a boxed section.

Wiring

Now comes the hard part. In a previous article I mentioned that I use a Power Probe to establish the state of a lead I'm checking. It's invaluable in this situation. You need to find a permanently live cable, and you must be sure that this remains live when the ignition switch is operated. Next you must find a switched live cable. In addition you need to find the indicator wires and, in some cases, the main beam wires and door switch wires – you may have to add extra leads if the vehicle has a hatchback or doesn't have courtesy lights on the back doors and bonnet. With alarms that incorporate immobilisers you might need to isolate the supply to the fuel pump

and ignition coil, so you may need to find these leads as well.

I cannot stress sufficiently the need to take your time when fitting these units because, in such a confined space, it's very easy to cut the wrong wire or place new wires where they hinder the reassembly of the trim panels. It's equally important that you solder your joints and then use shrink-wrap on them.

It is important to pull enough wire from the loom to be able to make the connections needed, and that you wrap the new wiring back into the loom neatly with insulation tape, making the finished job look as if it was factory-fitted. This will fulfil two requirements. First, should anyone need to do something in the area where you've been working they won't be able to criticise your job. Secondly, and more importantly, should the vehicle be broken into the thief won't be able to simply reach under the dash, rip out your new and very obvious cabling, short the leads together, start the vehicle and make off with it.

Immobilisers

Immobilisers are cheaper than alarms. But don't think that because they are cheaper they are easier to install.

Some have a key-like device, which requires a suitable hole, to activate the unit. You must find a place in the dashboard to drill the hole, which should be in a position that's easy for the driver to reach. The dashboard often has a blanking plate which you can drill for the flashing LED. I wouldn't recommend that you use such a position for the key circuit, because this will leave it too easy to remove or tamper with.

Another problem with immobilisers is that they usually have four circuits that need to be connected but, to confuse you and a would-be thief, the wires are all coloured black.

The important thing is to work on one circuit at a time, and to cut, solder and shrink-wrap the joints, incorporating them in the loom neatly. Never leave excess wire coiled up because you are too lazy to cut it to size. This not only looks bad: it tells the would-be thief straight away where to start looking.

In conclusion

I hope these notes will have made you more confident about the prospect of fitting alarms and immobilisers. It's my experience that when you have done one you will want to have another go and so on, giving you worthwhile business. ■

The Panasonic Euro-4 Tau range

As a follow-up to his article on the technical features of the basic Euro-4 chassis, Brian Storm describes the differences with the more sophisticated Tau version

The Euro-4 chassis is predominant in the current range of Panasonic digital TV models. In 1998-99 the company introduced its Tau sets, which mainly use the Euro-4 chassis. Tau is a Greek letter that represents perfection. Panasonic uses it on a worldwide basis for a range of slim, silver-cased TV models fitted with Quinrix-F CRTs, which provide improved picture quality.

The Quinrix-F tube

The Quinrix-F tube has many design improvements including a super-flat screen with, for top-end models, an anti-reflective coating. A coma-corrected deflection yoke gives improved resolution over the entire screen area by avoiding the tendency to elliptical distortion of the scanning beams towards the edges of the display area. Electron guns with large, overlapping fields improve the focusing all over the screen.

Along with these improvements in CRT design, the Tau version of the Euro-4 chassis has additional circuitry to optimise the picture display. To complement the Tau sets' improved video presentation there are also improvements in the sound section.

Dynamic auto-focus

The dynamic auto-focus (DAF) used in 32in. sets such as Models TX32PK1, TX32PK2 and TX32DT2 is adapted from the Euro-5 chassis, which we will look at in a later article. The basic dynamic auto-focusing technique reduces the tube's focus voltage towards the edges of the screen. This gives an appreciable improvement to the edge focusing, especially in conjunction with Quinrix-F tubes that, by design, can produce a pin-sharp display all over the screen.

Fig. 1 shows the basic DAF circuitry, which is based on the AN5422K chip IC3901. For simplicity, some of the connections to IC3901, a 22-pin device, have been omitted. IC3901 generates horizontal and vertical DAF drive waveforms which are synchronised by pulses from the line and field output stages. Line pulses are fed to pin 13 via C3954, Q3901 and C3942. Field pulses are fed to pin 15 via D3921, Q3917 and C3945.

Pin 21 of IC3901 feeds a parabolic vertical drive waveform to the buffer transistor Q3903, which is coupled by C3923 to the cascode

output transistors Q3907 and Q3906. The output stage produces a 250V peak-to-peak parabolic, field-frequency waveform across one of the windings on the DAF transformer T3901.

Pin 3 of IC3901 produces the horizontal DAF drive, which is fed via Q3902 and Q3904 to the MOSFET output transistor Q3905. Once again a 250V peak-to-peak waveform is generated, across a further winding on T3901. Q3905 is also controlled by a slow-start circuit, whose active components are Q3912 and Q3911.

The output winding on T3901 feeds the dynamic focus-correction waveforms to the line output transformer, where they modulate the static focus voltage. The fourth winding on T3901 provides AFC feedback.

Q3908 is the key component in a protection arrangement. Its base circuit monitors the operation of the DAF system. If there is a drive failure or abnormal voltages are present Q3908 activates circuitry that puts the set in the standby mode. This is something else that might need to be checked when a set is stuck in standby.

Geomagnetic correction

Local variation in the Earth's magnetic field may affect the display produced by a large-screen TV set. Such variations can result in the picture tilting to the left or right – depending on where the set is situated. Tau sets with geomagnetic correction have a user adjustment that's available by toggling through the user controls inside the front-control panel.

The circuitry involved is shown in Fig. 2. It uses the LA6515 chip IC1901, which incorporates two operational amplifiers, and is controlled by pin 77 of the main microcontroller chip IC1101. Q1901 (BC847B) buffers the input from IC1101. The op-amps in IC1901 control the current through the E/M coil, which is on the CRT's scan yoke. The picture can be rotated in either direction by varying the direction of the current through this coil, thus cancelling the tilting effect produced by the Earth's magnetic field.

RGB mode 4:3 operation

The Euro-4 chassis employs a video-processor chip that incorporates horizontal compression and expansion for use with 16:9 CRTs. This is accessible only via the composite video route however. As the RGB stages follow the scaler

section in the IC, switching an RGB display between 16:9 and 4:3 is not possible.

A modification has been added in the line-scan circuit of 16:9 sets to overcome this limitation, see Fig. 3. Relay RL580 introduces switched changes in the line-scan current path. The relay is driven by

transistor Q580, which is controlled by pin 45 of the microcontroller chip IC1101. In this way the normally fixed 16:9 RGB display can be altered to the 4:3 aspect ratio.

Depending on the model, this additional circuitry is either on the main PCB (E) or on a separate, additional PCB.

AFB technology

Because of the slim, stylish cabinets used by Tau sets there is little chance of producing good bass and treble response using conventional speaker technology. Where high-quality sound is a requirement, as in top of the range models, Panasonic employs active acoustic feedback (AFB)

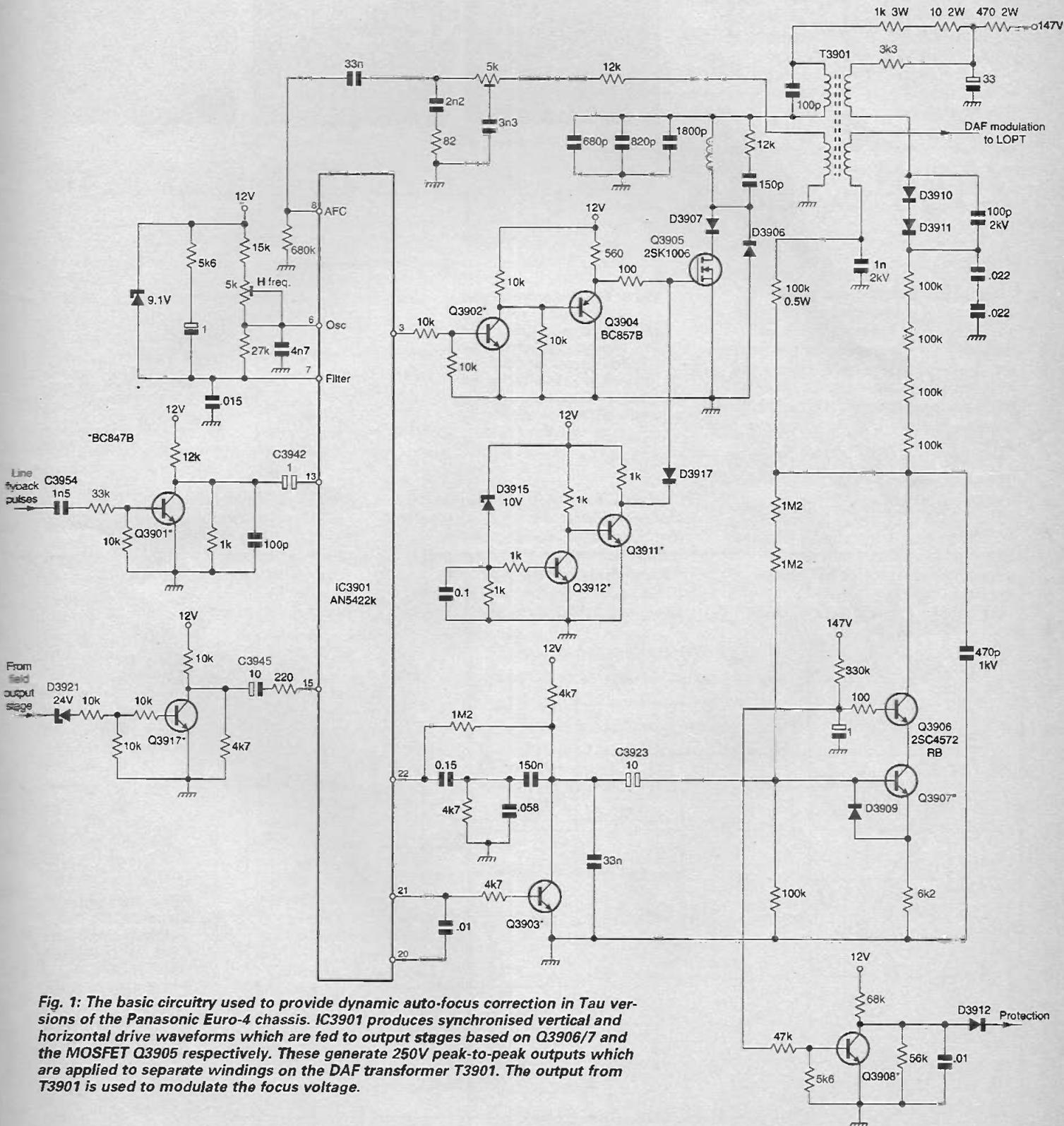
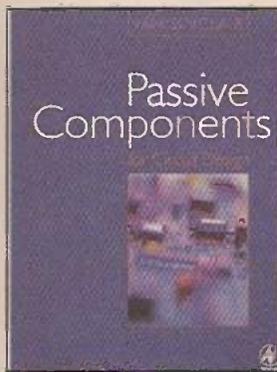


Fig. 1: The basic circuitry used to provide dynamic auto-focus correction in Tau versions of the Panasonic Euro-4 chassis. IC3901 produces synchronised vertical and horizontal drive waveforms which are fed to output stages based on Q3906/7 and the MOSFET Q3905 respectively. These generate 250V peak-to-peak outputs which are applied to separate windings on the DAF transformer T3901. The output from T3901 is used to modulate the focus voltage.

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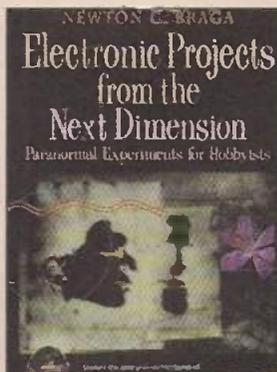


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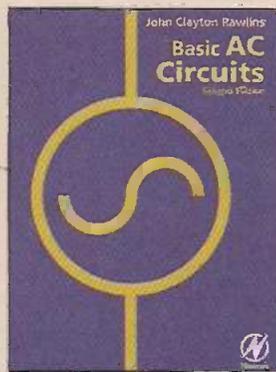


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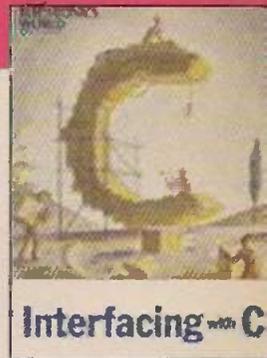
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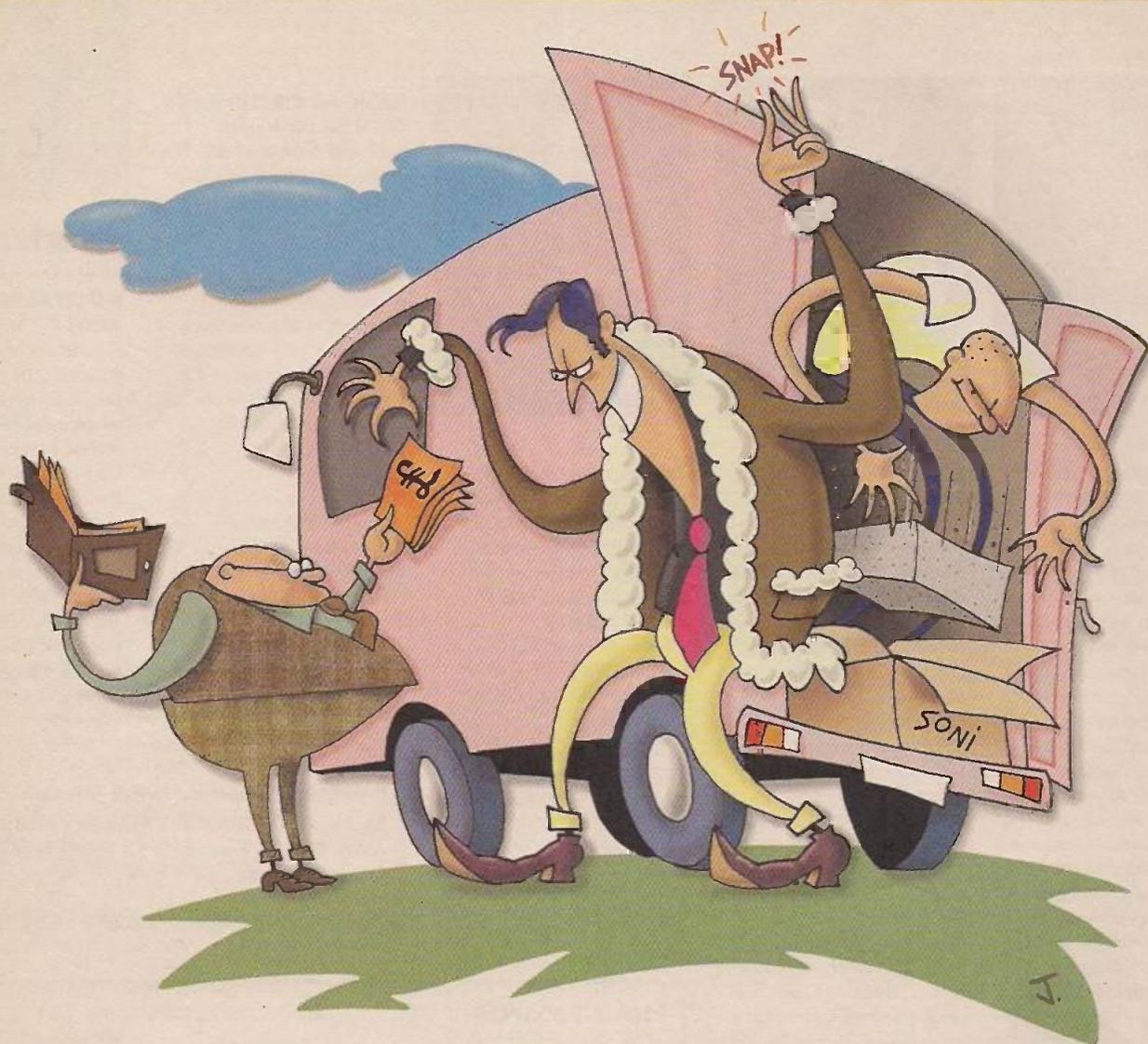
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Servicing suburbia style

I run my own business and carry out most of my repairs in customers' homes. One advantage of this is that I meet all sorts of different people from all walks of life. It's much more interesting than sitting at a bench fixing one item after another.

You've all seen those chat shows like Jerry Springer, Trisha etc., and may have wondered whether people really do behave like that. The answer is yes they do – well, a few of them do. Here are some recent experiences.

Bought from travellers

People buy their equipment from odd sources, and sometimes wonder why they get ripped off. Mr McDonald bought a 'Sony' TV set from some travellers who were selling them from an unmarked

All sorts of things go on in the leafy suburbs, as tellyman Michael Maurice relates

white van. He also bought a Philips video. He wanted me to tune the two in for him.

The set wasn't a Sony of course. It was an Alba or a Bush, with the original manufacturer's label peeled off and a Sony badge stuck on in its place. This is becoming quite common practice. The sets are wrapped in cling film and sold as 'stolen'. I told him he was lucky he didn't get a box of Thermalite bricks, as one

unlucky (stupid?) punter did. Incredibly, Mr McDonald had heard about this.

Luckily for him the set had the right remote-control unit, so I was able to tune it in. He wasn't so lucky with the Philips video, which took his tape and refused to give it back. When I asked him for the video's remote-control unit he handed me an Amstrad one!

Mr McDonald mentioned that he had paid over £300 for the TV and VCR. The TV set sells for £189 in Tesco, and the VCR for under £90 in most multiples. He felt rather peeved when I told him this.

The police and trading standards people are looking into the practice of selling sets from vans. Some of these traders have been prosecuted, usually for illegal use of trademarks, e.g. Sony. The sets are not usually stolen goods, and if the police

question such a trader he can generally produce paperwork to prove ownership. But it's a lucrative business. The sets are wrapped in a very professional manner, and may even look new. Some are boxed – and some boxes contain just Thermalite bricks. I'm told that such traders often sell more TVs and VCRs in a day than some legitimate shops manage in a month.

All dressed up

I got the message from Dot to service her Granada TV and as she was just around the corner I made it my first call. The door was opened by an unassuming middle-aged woman who showed me into her living room where the set was installed. While I was repairing it I couldn't help noticing the photos around the room.

They were of a lady who was dressed in glamorous apparel of various sorts. I'm sure you know what I mean! Being inquisitive, I asked who the girl was. The answer surprised me to say the least.

"Oh, that's my boyfriend. He likes dressing up like that. We met at a transvestites club".

I completed the repair as quickly as possible and departed.

Education

When I worked for a large service company one of my job cards said the complaint with a 25in. Hitachi set was "won't switch on". On my arrival I asked the customer what was wrong with the set. She picked up the remote-control unit, pointed it at the set and said "look, it won't switch on".

It came on when I walked over to the set and pushed the on/off button in. I didn't feel guilty about charging a £15 'education fee'. After all that's what I had done, and I'd had to make the call.

Another customer complained that her Amstrad DD8900 video recorder was faulty, but only on Tuesdays and Thursdays. It transpired that she used it mainly for recording *EastEnders* (it was on twice a week at the time). There was nothing wrong with the machine. It was simply that she didn't understand how to use the timer. Another education fee was charged.

Aerial installation

While taking my daughter to school I was collared by one of the mums. "Do you adjust aerials?" she asked.

"How do you mean, adjust aerials? Aerials shouldn't need adjusting."

It transpired that her husband had got a friend who said he could fix aerials to install one. It hadn't been a success. So, being the nice guy (mug?) that I am, I agreed to go back to her house to take a look.

She lived in a nice suburban semi. I

noticed that all the others in the road had aerials attached to the chimneys, but not hers. The problem was that her TV picture suffered from ghosting, and there was some graininess.

"The aerial should have been installed on the chimney, and connected to the cable in the loft" I said. "How was it adjusted?"

"He gave me a walky-talky and, as he moved the aerial around, asked me what the picture was like."

I suggested a new group A aerial, fitted correctly on the chimney, and gave her a very reasonable price. Knowing her husband, I can understand why I didn't hear from her again!

The phone

Ring, ring. It was six o'clock on Sunday morning when this lady phoned. I'd visited her a few days before and recognised the voice.

"Do you know what time it is?" I asked.

"No, I'm getting my things ready for a church service."

"I'll call you back later" I said, and put the phone down.

Another phone call came from a customer who couldn't sleep. It was a quarter to one in the morning when Tanya rang. She'd booked the boxing with Sky box office and found that she couldn't receive it. To get these channels with her Pace PRD800 receiver she needed an expander, and pleaded with me to come out. I quoted her an exorbitant amount, £80, to supply and fit an expander and tune it in.

"That's all right, please come quickly" she replied.

It took me fifteen minutes to get there, five minutes to fit the expander and tune it in, and ten minutes to drink the glass of champagne she provided.

There were a couple of male guests, one of whom was a solicitor.

"Don't you think £80 was rather a lot for what you've done?" he asked.

"Well, it is one o'clock in the morning you know. Now, I gather that you're a solicitor. What do you charge an hour?"

"One hundred and twenty pounds" he said.

And that was presumably without VAT.

Neighbours

Our neighbours' son is a bit flash and a know-it-all to boot. He was into buying and selling computers. In fact he tried to sell me a laptop. It had a Chinese keyboard, so I declined.

One day my wife noticed two strangers in the garden – it was a sunny day, and the patio door was open. The strangers were police. They had raided next door for stolen computers, had seen my workshop, and thought they had a double whammy!

I explained who I was, showed them my business card, and was able to identify the owner of each piece of equipment. They seemed to be happy and went back next door.

Later that afternoon they called for some vans to collect the 'evidence', and our whole drive was covered with computers.

A job in Pinner

But my favourite story concerns a young lady from Pinner. It was a nice, sunny Friday afternoon and, earlier, my wife had drawn my attention to an article in the local paper. It said that the London Borough of Harrow has the largest number of brothels in the country. At about half past three the phone went.

"Can you mend my Matsui?" a young lady's voice said.

"Yes. What's wrong with it?"

"The picture fades out then comes back on. How much would it cost?"

"£XX if the fault's what I think it is."

"How long will it take you to fix it?"

"About twenty minutes to half an hour."

"That's OK. Incidentally we work in the area but don't live here. Can you come soon?"

"Give me half an hour."

So off I went to Pinner. The lady had also asked to see a couple of my previously-enjoyed televisions (second-hand sets!), especially as I had a price realignment (sale). Naturally I was happy to oblige.

The door was opened by a young lady who showed me into the living room. Another young lady, in a rather revealing dress, was present. I started to demonstrate the TVs, then the phone began to ring. Not once, but several calls in succession. Then the door bell rang. I thought it might be for me, as I'd left the car hatch open. But no, a man in a pinstriped suit came in. He went upstairs with the other lady, and ten minutes later they came back down. This continued.

"Michael", the first young lady said, "you might have gathered that this is a massage parlour."

"I sort of gathered that. But it's your business, not mine!"

The phone went again, and the young lady started to provide details of what she was prepared to do for £40. By this time I'd opened up the Matsui 1440 and found the dry-joint in the CRT's heater circuit. Five minutes later the back was on and the set was working.

"I thought you said it would take twenty minutes to fix the set" the first young lady said.

"Well" I replied, "some jobs take a bit longer than others. It's probably the same with you!"



Restoring vintage radio sets

In this second instalment Ian Rees deals with the tricky subject of finding suitable replacement components for use in vintage radio sets and describes some repair possibilities

Last month's article dealt with basic circuit operation in valve radio receivers, fault finding and the symptoms caused by failure of particular components. Having located a faulty component the restorer has to replace (or repair) it, the aim being to use a type as close as possible to the original in size and shape. Modern components tend to be a fraction of the size of earlier types, and some consideration is required to make them look the part.

Capacitors

As mentioned last month, waxed-paper capacitors are the type of component that will most often require replacement in vintage equipment of any type. The nearest type of capacitor I have come across that doesn't offend the eye is the PC/HV/S series manufactured by LCR. These are low-loss polypropylene

capacitors with axial leadouts and a yellow, moulded construction. They are available in values from 0.001 μ F through all preferred values up to 0.47 μ F, and are rated at 1kV. CPC stocks them, the order codes running from CA00095 to CA00101. Their physical proportions are similar to the components being replaced.

Electrolytic capacitors are the next type of component most likely to be in need of replacement. Modern types, even of higher working voltage, are likely to be smaller and of different construction to vintage ones.

There are two options with high-voltage, clamp-mounted smoothing blocks. The first is to snip and isolate the terminals of the original component and use a smaller, modern axial electrolytic as the replacement. Mounted out of sight, it won't look too bad. Always leave the dead capacitor in place, to maintain the look of

the chassis. The second option is to use the original capacitor as a housing for the replacement. Disconnect the original, being careful to keep its solder tags intact. Unbolt the chassis clamp and remove the capacitor. Dig out its internal contents and mount the replacement(s) within, using the original terminal ends for connection. Once the original can has been refitted it provides a superb illusion that no change has taken place. But it takes time to do. The older waxed cardboard-box multi-block capacitors can also be made up in this way.

The same can be done with lower-voltage types. A higher working voltage modern axial capacitor can be used to provide approximately the required size ratio.

Ceramic and mica capacitors give little trouble. If they do, the modern silver-mica type has similar proportions.

In TRF sets you often find a pair of insulated wires that are twisted together and connected between the tuning gangs for feedback purposes. These form a small-value preset variable capacitor: the tighter the twist, the higher the capacitance value.

Trimmer capacitors of the postage-stamp compression type are very robust, but the porcelain collars can break when moved.

A plastic washer works just as well, and the mica insulation can be substituted by cutting the mica washers used with power transistor heatsinks.

Air-spaced tuning gangs can be a heartbreaker if damaged. Found in all shapes, sizes and variance laws, the likelihood of obtaining an exact replacement is virtually nil. With a lot of patience, using a battery/buzzer continuity tester, shorting vanes can be set back in place. Before starting the process, ensure that the moving rotor vanes sit in the centre of the fixed vanes. Adjustment is by releasing the locknut at the end of the gang and adjusting the screw. Gently close the gang, using the screw to centre, visually, the moving vanes between the fixed ones. Then tighten the locknut. When using an electric buzzer, a small spark can be seen in subdued light at the point where any vanes touch.

Feedback adjustment for reaction control in old TRF sets can be by means of an air-spaced capacitor or a variable potentiometer. In early UK sets you more often find a compact solid-dielectric variable capacitor, which has thin mica sheets instead of air between the plates. Damage can occur when this type is swept open and closed rapidly, hitting the end-stops. The capacitor either goes short-circuit or becomes noisy. The rotor is connected to a central tag terminal by a piece of braid that can break. Some capacitors can, as a last resort, be taken apart and rebuilt, but they are best left alone if they work, even poorly. Do not use switch cleaner on them, as there are no wiping contacts and they will stop working altogether.

Resistors

Carbon resistors always look a motley bunch in vintage sets. The colour code can be difficult to discern, but the values are usually accurate. An all brown resistor may be a 100Ω type or could just happen to be brown with the other bands or dots having faded. The old resistor colour code is read by body colour first, then the tip colour, the multiplier being the dot or band near the centre. Tolerance is indicated by a gold (5%) or silver (10%) marking near the end of the resistor body: no colour means 20%.

Use of a higher-wattage rating than required will maintain the size ratio with the original resistor.

There is no colour code with wirewound resistors, the value being printed on. The compound that coats the wire often cracks or discolours, and the printed value is lost. Except for heater droppers (see AC/DC radios, last month) wirewound resistors are not super critical. With an open-circuit resistor the value can be obtained by exposing the wire in the middle (a needle file used gently is good for this), measuring the value to the good end and doubling it. This assumes that it looks like

a linear winding. I've managed to get close by using a quarter or a third of the winding and multiplying up.

Variable resistors

Volume and tone controls become noisy with time, especially when the potentiometer also contains the on/off switch. They almost always respond to the use of switch cleaner, which can usually be inserted through the wiper end-stop indents in the potentiometer's metal casing. Some cleaner can be shot through the rivet fixing of the track, or the gaps through which the tags go. It is very easy, when you think you've found a way in, to blast away with the aerosol spray only to receive a face full of cleaner as it returns from a blind hole. After many such face washes I now instinctively look away.

Some controls are sealed tight. You can drill through into the casing, but make sure that the wiper and track are not damaged. Drilling is best done with a miniature drill. It's best to stop just short of penetration of the cover, completing the operation with a small, sharp metal spike. This prevents metal swarf getting on to the moving parts of the control.

In some better AC sets you may find a small wirewound preset that's known as a humdinger. It's connected across the heater supply, with its wiper connected to chassis earth. The idea is to balance out hum voltages. Adjustment is for minimum hum from the loudspeaker.

Transformers

Mains transformers in old sets were generally well made. Insulation and shorted-turns problems do occur, but replacement parts are available from several companies including Maplin. I have rewound several transformers quite successfully, but it's a labour of love, not finance. Many simply unbolt, with the E and I core sections pulling apart to release the bobbins.

One problem that's easily overlooked occurs with the voltage adjuster: corrosion of the phosphor-bronze strip results in poor connection, giving the impression that the transformer has gone open-circuit. Cleaning is not 100 per cent effective, and I've found it necessary to bridge the tap with a wire link.

The primary winding is tapped between 200V and 250V. The main secondary winding, depending on the type of rectifier circuit used, is typically 0-250V, 250-0-250V or 350-0-350V. There may be several LT windings. Where no suitable single transformer is available I've been forced to use combinations of LT and HT transformers. These were used in larger radiogram sets where space is not a problem.

Beware of autotransformers. Seeing what looks like a transformer can lead you to think that the chassis is isolated. Some US (and UK) manufacturers used this type

of transformer: big surprises if you fail to spot this, as the chassis will be live.

Valve audio output transformers give little trouble. A few break down to frame, causing shorts, but this is very rare. They can be rewound. I have used a heater transformer as a replacement in a class A audio output circuit when nothing else was available: it worked tolerably well and is still going after five years!

A few manufacturers used a tapped choke and a capacitor as a means of coupling the output to the speaker. This might be puzzling if not expected.

IF transformers and RF coils

Most vintage radio IF transformers are very large by modern standards. Compression capacitors mounted in the can were always a target for DIY amateurs who would tighten them down hard, causing damage. Dust cores could break, or get screw-locked together in the transformer. If the former rotates on its base, the fragile wires from the coils can be fractured.

Because the cores are very delicate, damage can be hard to remedy. Cores come in many different forms. Early types are fitted to brass screw studding. The ends of the studding will be visible, sticking out of the top and bottom of the screened IF can. The studding can be paint- or spring-locked into position and doesn't cause any problems. Dust or ferrite cores screwed into threaded coil formers cause most of the trouble. Use of incorrect type tuning tools will break or wear away the adjustment slot or crack the core.

An IF transformer has two cores in the same coil-former tube. When these are locked together in the centre they can be difficult to free. Most dust cores have an adjustment slot at both ends. If one end is damaged, simply reverse the core. A broken core rarely cracks down the middle but breaks diagonally, sideways. Access to its good end is usually possible by removing the bottom core from the former – count the turns out as it's removed, so that it can be set back in the right place. Get at the top one from that side.

Cores that are locked together can be drilled (use a dentist's burr) or chipped out (if broken), but be prepared for failure. You can try using a pair of fine tweezers, jamming its points down each side of the slug and turning. If there is still some exposed thread in the coil former, a wand (see alignment, later) could be used to see if tuning is possible with the locked cores in place. A piece of brass or ferrite could be positioned to tune up the faulty transformer. I have used miniature transistor IF transformers successfully as replacements, ignoring the neutralisation tap. When first tried this was a tongue-in-cheek repair, but it worked well and I've since then done the same thing on a couple of occasions with complete

Table 1: Common vintage UK valve codes.

Code	Indicates
AC	4V heater
D	Diode
DD	Double diode
DDT	Double diode triode
FC	Frequency changer
H	Triode
M	4V heater
ME	Magic-eye tuner
Pen	Pentode
PP	Power pentode
PT	Output pentode
R	Full-wave rectifier
SP	Straight pentode (RF)
TH	Triode heptode
TP	Triode pentode
U	Half-wave rectifier
UU	Full-wave rectifier
VP	Variable-mu pentode

As an example, an AC/Pen would be a pentode with a 4V heater.

success. The replacement IF transformer can be hidden inside the original screening can.

Paint- and wax-locked cores must be freed before adjustment can be carried out. A hot soldering iron applied to the core will crack the paint or soften the wax. The paint will likely stay free, but the wax will harden as it cools. With the wax still soft, run the core out from the former to clear the thread. This will make adjustment easier. Any attempt to force coils while locked could result in the troubles mentioned above.

The fine wire used for the windings (especially multi-stranded Litz wire) is hidden from sight and can be dry-jointed, causing various symptoms. Unlike modern enamelled wire, which dissolves into a flux when heated with a soldering iron, this old wire has to be abraded to find the copper underneath.

It's possible to rewind an IF transformer. Neat, piled windings can be substituted by scramble winding and still work. To get the correct inductance, you might have to experiment with the number of turns. Plastic or fabric washers fitted to the coil former as cheeks can be used to contain the windings. Always try to maintain the same distance between the two windings, otherwise coil peaking will be impossible.

As far as tuning cores are concerned, RF coils suffer from the same problems as IF transformers, except that only one core is usually involved. An aerial coil (e.g. L1 in Fig. 2 last month) that's connected to a long outside wire can go open-circuit as a result of a near-miss lightning strike. Any aerial isolating components – commonly a capacitor – present in the circuit will also be damaged. The same isolating component(s) in an AC/DC set can cause coil failure if they are leaky with live

mains connected to the chassis.

Good, long wire aerials were always recommended – say 100ft in length. Not everyone could manage this and most made do with something less effective. One trick was to connect the aerial terminal to earth. This was noisy but effective. Unfortunately it could also blow the fine aerial coil wire.

Shorted turns in any coil will cause a large inductance change, which may be too great to compensate with the tuning core or trimmer capacitor. In this case rewinding or replacement is the only possibility.

Many vintage radios incorporate a frame aerial. Hidden in lids, backs and cases, they are not always obvious. They usually consist of the aerial coil wound on a very large former. For this reason winding repair must be done with care. Both long- and medium-wave coils will be included in the frame construction. Broken leadout wires are common when the coil is in a hinged lid. External aerial sockets were often tapped into the frame via a capacitor or loop. Poorly aligned or unstable sets will often perform strangely when a hand approaches the frame.

Chokes

RF chokes give little or no trouble unless they are dry-jointed to their leadout wires. Iron-cored chokes were widely used for smoothing HT and LT supplies in vintage radios. A faulty HT choke is rare.

A special type of loudspeaker had a built-in choke that doubled as a solenoid magnet for the speaker. The solenoid developed a larger magnetic field than could be achieved with the permanent magnets of the time. These mains-energised speakers induced a hum ripple into the sound through the magnetic field. A hum-bucking coil was used to reduce

this. It consisted of a few turns of wire, mounted behind the cone, connected in series anti-phase with the speech coil to cancel the ripple. Beware, because the full HT voltage is present at the exposed field tags of such a speaker. These speakers always seemed to work all right but, if you are faced with a faulty one, a conventional permanent-magnet type will do. A smoothing choke could replace the field coil: alternatively a 2k Ω , 5W wirewound decoupling resistor with larger/additional smoothing capacitors could be fitted.

Loudspeakers

Early loudspeakers were redesigned headphones. Instead of a metal diaphragm, a metal rod vibrated above the high-impedance speech coils: the rod was connected to a paper cone by a long screw. This type of speaker produced very thin, poor-quality sound. The balanced-armature types that followed were not a lot better. Improved sound quality had to wait until the development of the moving-coil speaker, which has changed little in basic concept over the years.

For a long time moving-coil loudspeakers had adjustable cones. Rattles can be cured by adjustment of the suspension (spider) to centre the cone. Two arrangements were common. The first had a single screw in the centre, front of the cone. The second had two screws behind the cone. Once the screw(s) have been loosened the cone can be centred. A speech coil that rubs against the polepieces can be heard by gently pushing the cone in and out. Use of paper or thin card feelers in the gap between the speech coil and the polepiece as an aid to centring is normal practice. Once centred, the suspension can be tightened and the result tested.

Damage to a paper cone can be easily repaired by applying a liberal amount of clear glue, such as Bostic, across the tear to bridge the gap. Close the tear when the glue is nearly dry but still movable. Larger tears can be patched with brown paper cut and glued in place. Where this shows it can be coloured black with a fibre-tip pen.

Because of the modest audio output from vintage sets an open-circuit speech coil is uncommon. A speech coil that scrapes against its polepiece can produce a lot of interference. The coil can be centred as described above. The two wires that provide the connection between the tagstrip and the speech coil can become fatigued and break. Replacement wire needs to be at least as flexible as the braid it replaces. Try not to allow solder to creep up the wire, as it will become stiff and snap.

While they are not as deep, modern replacement loudspeakers do not look out of place in these sets if they are of the correct diameter.

Switches

Yaxley style switches, made of Paxolin, are found in most vintage radios.

Breakdown can occur. Mostly used for wavechange operation, the contacts are self-cleaning. The shape of the contact is most important. As the moving wiper contact engages, the fixed one should be seen to part and open slightly. If the switch has been roughly used, the rotor will catch the edge of the fixed contact and damage it. With age, the fixed contact loses its spring and doesn't close around the rotor. In both cases gentle adjustment of the rotor will restore operation. Switch cleaner works well with these switches. A two- or three-way single bank switch based on this action may be used for tone control switching. Handle this in the same way.

A push-pull switch with a brass band that shorts a couple of contacts together was common in early sets, serving a similar purpose. This type is very reliable, though a bit of grease needs to be added to get the snap action to feel right.

Press-button and piano-style switches are a problem that's difficult to solve. Even when they were nearly new, owners resorted to jamming matchsticks in the buttons or keys to hold them in position. The latching mechanisms seem to wear very quickly.

The self-cleaning action of Yaxley switches was not carried forward successfully in many of these designs. Switch cleaner will not always cure contact problems and will, in some cases, make things worse, washing out the little

grease that's left to prevent corrosion. Proceed with caution, and be grateful that the switches work at all.

The mains on/off switches built into volume and tone controls are similar to present-day ones in the way they work. They are difficult to get into and cannot usually be repaired. Replacement controls of similar size are hard to obtain, so a modern component may have to be used. I can remember bending back the lugs of these switches when they were plentiful and refitting just the switch section.

Mains switches should be of the double-pole isolating type. When a replacement is required, this type should be fitted.

Fuses and dial bulbs

Fuses are rare in old radio sets. An early method of providing protection for circuits was to use fusewire soldered between tags. The presence of the fusewire was often not indicated anywhere. A vaporised wire can leave no trace, making diagnosis a puzzle. Fusewire can sometimes be found screw-locked inside the mains tap.

The most common type of fuse used in valve radio sets is the 1-25in. glass type, mounted in some kind of holder. The rule with any fuse that's mounted in an enclosed cartridge fuseholder of the chassis-mounted type is that the incoming live mains connection should be made to the tip of the holder, not the side. This ensures that when a fuse is taken out it will not be able to give whoever removes it a nasty shock.

Some transformers have a slow-acting

thermal fuse, which is a spring-off device. It consists of a phosphor-bronze spring that's soldered to a copper plate. The plate is embedded in the transformer's core and is connected to the primary winding. The spring part is connected to the live mains input. Should the transformer's temperature become excessive, the solder will melt and the spring will then disconnect the mains supply to the plate. To reset the fuse, after cooling, push the spring back into contact with the plate and apply a soldering iron. A variation on this theme is a bimetallic clip that holds the spring: to reset, all that's required is to push the spring back into place. In both cases the fuse can fail because of fatigue. Provided the transformer isn't overheating, the cure is to resolder the first type of fuse and retension the second type.

Dial bulbs often doubled as fuses. Glowing gently in an HT circuit, they would blow should the current be excessive. In most AC-only sets the dial bulbs are connected to the 6-3V heater supply: a shorted bulb holder can produce a comprehensive burnout of the heater wiring all the way back to and including the mains transformer. AC/DC sets often have a resistor across the bulb supply to enable the set to function when the bulbs have blown. This resistor can go high in value: as a result, new bulbs will have a very bright but shortened life.

Valves

Thousands of different types of valve were produced. I am fortunate in that I

Table 2: Pro-Electron codes used by Mullard for later type valves.

Code	First letter Heater	Second/third letter Valve type	Code	Base type
A	4V	Signal diode	0	Misc (P, side-contact etc)
B	0.18mA	Double diode	1	Misc
C	0.2mA	Triode	2	B8B/B8G (Loctal), B10B
D	1.2-1.5V	Output triode	3	International octal
E	6.3V	Tetrode	4	B8A
F	12.6V	Signal pentode	5	B9G/B9D
G	5V	-	6	Sub-miniature (B3, B4A, B5 etc.)
H	0.15mA	Hexode	7	Sub-miniature
K	2V	Heptode/octode	8	B9A
L	0.45mA	Output pentode	9	B7G
M	-	Magic-eye		
N	-	Thyratron		
P	0.3mA	-		
T	7.4V	-		
U	0.1mA	-		
V	0.05mA	-		
W	0.6mA	HW rectifier (gas)		
X	0.45mA	FW rectifier (gas)		
Y	-	HW rectifier		
Z	-	FW rectifier		

As an example, an ECL86 is a valve with a 6.3V heater incorporating a triode and an output pentode and having a B9A base. The second number is used for identification where there are similar valves, e.g. in this case the ECL80. If the valve type has only one number, the preceding digit is assumed to be zero.

didn't throw my old valve data books away. In the absence of a circuit diagram, the valve pin connections and voltage/current ratings greatly assist with fault finding.

When a fault is present, the valves are the easiest items to blame and to check – by substitution. But valves were always a lot more rugged than the public realised. "I think it's the valve" is still heard today. In fact valves tend to be the symptom rather than the cause. Yes, a valve may need to be replaced, but it will probably have continued to work to the end without having provided any external signs of being defective until being pushed over the edge by a faulty passive component, typically a changed-value resistor or a leaky capacitor. For years I had on show a valve that had run so hot the glass had melted and collapsed inwards: it had continued to work without losing its vacuum. When you replace a valve, check its operating conditions before you put yourself on the back for a job well done.

Manufacturers used codes to indicate the purpose and characteristics of a valve. Early codes were simple and descriptive. As types proliferated, they started to get longer and unwieldy. Table 1 provides a list of some of the more common vintage UK valve codes. Table 2 lists the Pro-Electron codes used by Mullard for later valves. They are much more useful.

Mains supply rectifier valves in vintage radio sets are of either the single- or double-diode type. The double-diode rectifier is used with the mains transformer in an AC-only set while AC/DC sets are more likely to use the single-diode type, to provide half-wave rectification. Interelectrode shorts were common and spectacular. Tapping the valve can induce the fault. AC/DC set rectifier valves such as the UY41 can also suffer from heater-cathode leakage. The result will be mains hum or worse.

When silicon rectifier diodes came along some bright sparks used them to replace rectifier valves. A BY100 diode strung between the anode and cathode of an empty valve base would really bring things to life – at least for a while. The set would fail after a short time when the reservoir and smoothing capacitors exploded. The cause of this situation is that a rectifier valve heats up more slowly than the rest of the set. By the time it reaches full operating efficiency, the output and all the other sections of the set will be drawing current and loading down the HT voltage. The silicon diode works instantly, and its efficiency is much better than that of a valve. As a result the HT rises to an excessive level, destroying the electrolytic capacitors which may blow off their end caps, sending their contents into the circuitry and sometimes up the wall, with a loud bang and lots of smoke. If you decide to use a silicon diode, fit a 100Ω resistor in series to reduce the

rectifier's efficiency and replace the electrolytics with higher working-voltage types to withstand the higher HT.

As mentioned last month, an output valve usually fails because its control grid coupling capacitor has become leaky. Some sound distortion is likely to have been the only symptom, with possibly a smell of burning. The valve very often survived after capacitor replacement.

Heater-cathode shorts mostly cause mains hum or distortion. Shorted heater turns are common. In an AC-only set the valve affected will glow more brightly. In an AC/DC radio set the affected valve will be dim while the other ones in the heater chain will glow more brightly.

Many better-quality radio sets were fitted with a magic-eye indicator, generally the Mullard EM34 in AC-only sets and the UM34 in AC/DC sets. They have a green phosphor display with a V-shaped shadow that closes in proportion to the signal received. Mostly they go low-emission. But you will sometimes find that a high-value resistor mounted on the base has changed value.

Valve testers

In the vintage years most labs and service workshops had a valve tester. This would check all the main characteristics of a valve, including any interelectrode shorts and heater-cathode leakage. Some had rotary or edge-operated switches that could be used to set up the working conditions of a valve by codes or direct voltage/current settings. Parameters could be checked using books provided, much like today's CRT testers.

Mullard produced a tester that did not use a meter. Instead, a CRT display was used to indicate the readings. For each valve type there was a punched card that you inserted into a slot. When a lever was pulled down the card was locked in place and the connections were made.

I made my own simple valve tester – and may do so again. It checked emission and for interelectrode shorts and heater-cathode leakage. The heater voltage was switch-selected. For test purposes the valve was treated as a diode. A DC meter showed the current passed by the valve. To check whether this was correct, I compared the reading with that obtained from a new valve. Flashes often occurred inside as shorts cleared – this is a common fault. A purple or pink glow was a sure sign that the vacuum was failing. Valve rejuvenation could occur during the test. This could extend its life, but the effect seldom lasted.

Valve handling and repairs

Damage can occur even when valves are handled with care. Older valves with fitted bases are best removed by gripping the base and pulling out. If there's a top cap, make sure that it will unclip from the valve connector easily. Many connectors

come away with the cap, snapping the valve's leadout wire. A broad-bladed flat screwdriver can be inserted between the cap and the connector, then turned to prise them apart safely. A loose connector can be glued back on to the glass with epoxy resin. If the connecting wire snaps, file the glass back gently, using a fine needle file; solder a fine wire to the connector, leaving a loop of wire protruding; make a small hook at the other end of the wire; solder this to the newly-exposed end of the valve's leadout wire; push any surplus wire up into the connector; and finally glue the connector back on to the glass with epoxy resin. This is a delicate operation, but I have always achieved a successful repair. Valve bases often become loose: they can be glued back in the same manner.

Some valves have a metallised coating. The wire that connects this to the earthed pin at the base can become disconnected. The cure is to wrap a few turns of thin bare copper wire around the metallised coating, near the base, then either solder this to the leadout or directly to the pin. Hold the wire wrap in place with PVC tape. A disconnected metallised coating can cause RF instability.

Miniature glass valves must be carefully handled and fitted. It is very easy to bend the pins, and straightening a pin can crack the glass. When they were new, valves with B9G and B7G bases came with small plastic protectors to prevent pin damage. If you have any of these protectors, they can be used to straighten the pins.

You sometimes find that an octal valve has been rammed into its Paxolin holder, making a new keyway. Look first before fitting: do not rely on finding the correct keyway by feel only. Many octal valves have the keyway broken off, giving seven ways to insert the valve incorrectly!

Beware of valves which are held in with a spring clip that locks over the top: if the clip is undone, it can slide down through the chassis and cause a short underneath.

Paxolin valveholders can break down. The holder is made from two pieces of Paxolin with pins sandwiched between the layers and secured with eyelets. Breakdown can occur unseen on the inside surface of the holder. HT rectifier and audio output valveholders are most prone to this. Leakage in a signal stage can cause very strange effects. The only way to fault find may be to isolate the supply to the pins.

Most valveholders will benefit from slight crimping of the contacts and an application of switch cleaner before the valve is refitted.

Next month

In the concluding instalment next month I will deal with the mysteries of tuning drive mechanisms and provide guidance on the art of RF and IF alignment. ■

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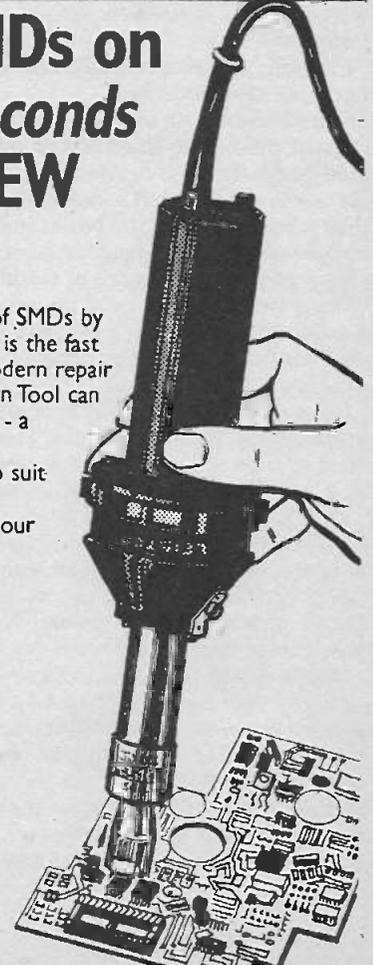
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Further confessions of a lecturer

I began my career as one of that band of vagrants who travel from hotel to hotel giving training lectures, and handing out plastic pens that disintegrate after two pages of A4, at about the time when TV sets began to use switch-mode power supplies.

Chopper circuits

After spending night after night propped up in some hotel bed or another studying the series chopper circuit used in the Thorn 3000 and 3500 series chassis (see Fig. 1) I decided that I knew all there was to know about such supplies. They were the first UK TV chassis to use such a power supply, an advance on the thyristor regulated power supplies that had till then been considered state-of-the-art in TV sets. The electricity authorities had taken a dislike to half-wave thyristor circuits which, operating *en masse*, were severely distorting the mains waveform. So they were shortly to become another bit of TV history.

Curiously, Thorn stuck with half-wave rectification – and a mains autotransformer – in the 3000/3500 chassis, but the line-frequency chopping didn't have the same detrimental effect on the mains waveform. It seems that, at the time when the 3000/3500 power supply circuit was being designed, there weren't chopper transistors capable of working reliably with the 320V or so provided by a mains bridge rectifier, and in particular with the flyback pulse that occurred when the transistor switched off.

But it wasn't just basic chopper circuit operation that required thought. There were all sorts of safety trips that were built in to prevent catastrophic failure.

I had to resume my nightly studies when the TDA4600 chopper control chip started to appear in many chassis. This was the time when designs from Japanese setmakers were taking over, and I had ponder over their circuits too.

I endeavoured to pass all this knowledge on to my trainees, being comforted by the thought that it would stand them in good stead when faced with a tripping or dead unit. Since the adoption of the chopper technique, power supplies have probably become the least reliable part of a TV set – and, subsequently, VCRs and satellite

TV receivers. So know-how on how to deal with them should have been able to ensure a reasonable income for the service engineers I was addressing. It certainly enlivened my interest in the subject. Of course, there very soon came the day when my lecture audience was peopled with Luddites.

"Yee can't beat a good ol' mains transformer and rectifier, I tell 'ee" came a cry from the back seats one night. This triggered a chorus of agreement.

Dealing with such dissent is not easy for the lecturer. I quelled the mob by doing a quick calculation of the approximate size of a mains transformer for a 26in. TV set, and adding "or you could go back to mains droppers!"

Secretly however I had some sympathy for their views – especially when, as was to happen later, the chopper took over in VCRs and satellite receivers. At the time of the initial dissent I had to rely on waffling for the five minutes or so until the tea-break came, then handing out the handsome ties emblazoned with the company logo.

Satellite TV

The start of Satellite TV meant another tour of the country, this time with a 65cm dish on a photographer's tripod, yards of stiff, unyielding cable, and sore fingers from those accursed F connectors. I was always given the type with a hex nut, but no spanner to fit them. The dish on its tripod generally worked well, and a "DANGER – HIGH VOLTAGE" notice kept curious passers-by at a reasonable distance.

One evening however, in the middle of a demonstration to a sizeable crowd of dealers, the signal suddenly disappeared. Guffaws and comments about reliability followed. I opened the curtains and peered through the steamed-up windows towards the spot where I had sited the dish. A herd of cows had ignored the warning notice and knocked the tripod over.

On another occasion I had set the dish up in the corner of the car park, then begun the lecture. About three-quarters of an hour into my talk the signals began to fade and, within a matter of five seconds, were totally gone. I switched to a demo

Phasor describes some of the pleasures and problems associated with being a lecturer on new products and technology

video tape and rushed outside to see what had gone amiss. A large box-van had backed into the space I had reserved for the dish. The driver was just locking its doors as I approached.

"It's the only space left mate" he said. "but at least people can't see your dish now!"

"No" I replied, "and they can't see any satellite TV either."

VHS video

When my company adopted the VHS VCR system it decided to launch an extensive programme of lectures and demonstrations covering the technology. Technical lectures were held during the day, followed by non-technical demos and hands-on familiarisation sessions for dealers' sales staff in the evening.

A more off-beat lecture and demonstration I had to give was for the Royal Navy, which thought that video would be a useful form of on-board entertainment for those at sea away from the UK. The Navy was particularly interested in whether the VHS mechanism was sensitive to the pitching and rolling of a ship. This had been a problem with earlier video equipment, whose use had been restricted to calm seas only.

I loaded a tape, pressed the play key and, after the picture had appeared, picked up the machine and turned it upside down. I'll remember for a very long time the looks on the faces of those at the lecture. One sailor commented that watching video would be the last thing he would be doing if his ship turned turtle.

Tricky moments

One character who turned up at many of my lectures was an elderly fellow with a loud voice and a corny sense of humour. I think he had been brought up on American comedy TV shows. He would always sit in the front row, and would give me hand signals, facial gestures and, from time to time, would burst in on what I was saying with a comment such as "try doing *that* with EF80s!" Half the trainees present had never seen an EF80. Given

the slightest chance, Al would inject his humour into the proceedings. But he could never get to grips with my own Goonish humour. Subtleties were beyond him.

Some of my worst moments were during the hands-on sessions, when trainees were let loose on current VCR models. The twanging of springs and cries of "oops" meant long evenings in the hotel bedroom putting machines back together again for the following day.

When the CD made its initial appearance it was plain that the old ways would have to go. The infinitesimal background noise level with a CD player caught me out nicely. I pressed play and there was silence. So, in the traditional manner, I wound up the volume control. A fraction of a second later the music began at a truly horrendous level. This was followed by silence: both speakers had odd bulges behind their black cloth fronts, and further investigation revealed cones that had turned inside out.

As safety standards advanced, TV sets became much less hazardous to handle with the back cover removed. It was claimed that you could, with some portables, grab the moulded body of the line output transformer with complete safety. This was true. What I omitted to say on one occasion was that, at this stage, the comment applied to small-screen portables only. I was reminded of my omission when, at break time, I heard the cry "yeeow - oh b*gg*r!", and saw an engineer nursing his hand and hopping from one foot to the other. He'd tried it with a 68cm model.

Lecture notes

The supply of good lecture notes as a part of any training has always been

important. Very often I'm told "Jim couldn't come today, he's got recurrent technofear". Then I'm asked for a set of notes for him. Unless I've printed enough copies, there can be embarrassment should the supply run out

Sometimes the amount of material you have to produce is enormous, especially when the service manual for the product concerned is a bit skimpy. Some circuit diagrams are very difficult to follow. There can be wiring harnesses, and there can be lines that come from an IC and simply end in a little label, say 'R615'. With a diagram that covers 400 square inches of paper with closely-packed hieroglyphics, finding this resistor or whatever can be extremely time-consuming. Providing course notes that

supply additional information to speed the engineer's search can also be time-consuming.

The process of printing comprehensive notes involves the use of several photocopiers, much to the annoyance of other members of the staff who want just a copy of an invoice or a memo. To overcome this problem, I hired a photocopier and ran it at home. Comments from the back of the lecture room on the print quality were henceforth ignored. If a complainant wanted to have a go next time, he was welcome to come along and try! By the end of a print run my family ended up knowing as much as I did about the products!

In conclusion

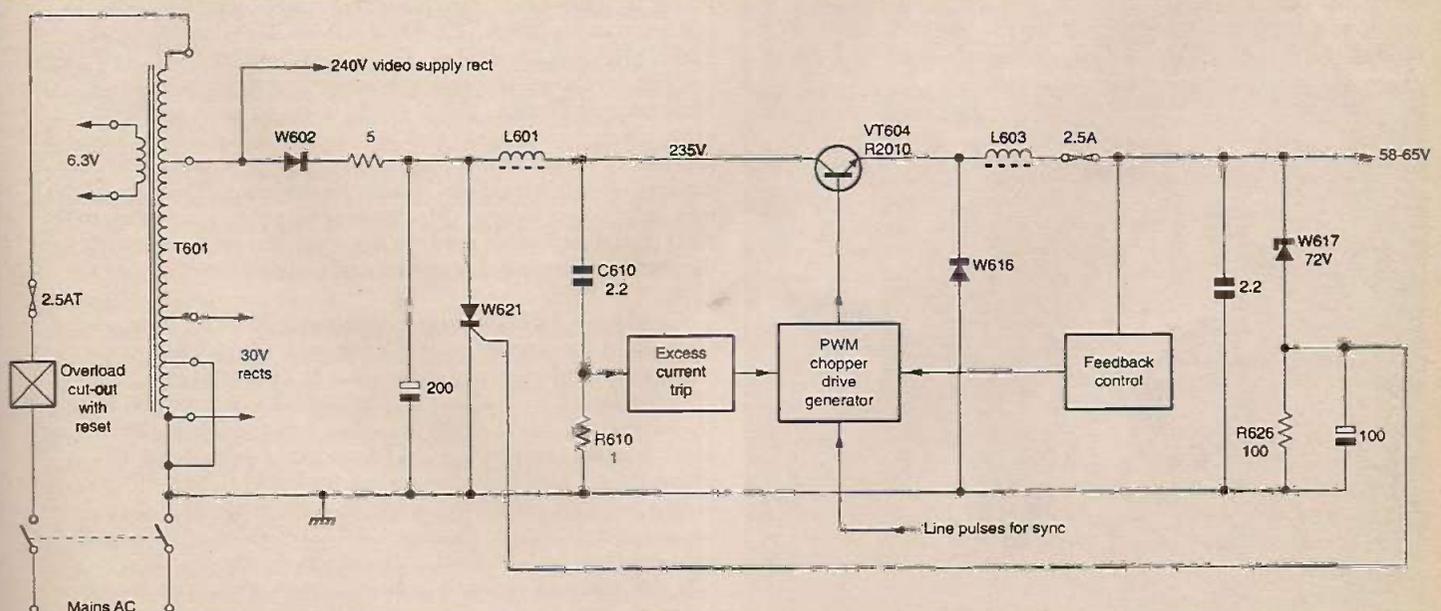
During the twenty five years or so that I've been lecturing and preparing material, things have changed dramatically. Early attempts to create illustrations and incorporate pictures into the text were literally cut-and-paste, with a pair of scissors and a jar of Stickfast. Then desktop publishing came along, with the ease of electronic cut and paste. A scanner, a digital camera and an inkjet printer are all nowadays invaluable tools in the lecturer's workshop. Powerpoint is revolutionising slide presentations. Life should be getting easier for us, but somehow it isn't. Computers crash and lose hours of work, files disappear miraculously or are sent by e-mail to a shoe company in Zambia. This is far more stressful than failure of a projector bulb.

Engineers who have attended my lectures have on many occasions commented that they wouldn't have my job for all the tea in China. I never confess to them that, actually, I enjoy every minute of it!

Fig 1: Basic arrangement of the series switch-mode power supply used in the Thorn 3000/3500 CTV chassis, the first chassis in the UK to use chopper technology. There is no mains isolation, as T601 is an autotransformer while the chopper 'transformer' L603 is a reservoir inductor. VT604 is the chopper transistor. W616 acts as an efficiency diode.

Comprehensive protection was built in. There were several fuses and an overload cut-out with reset button. A short-circuit chopper transistor could have meant disaster in the line output stage, so over-voltage protection was provided, using a 72V zener diode (W617) and crowbar thyristor (W621). Excess current was detected by C610 and R610. A feed from their junction was taken to another thyristor, which removed the chopper drive when it switched on.

The chopper circuit operated at line frequency, synchronised by pulses from the line output stage.





Terrestrial DX and satellite TV reception reports. News on terrestrial TV and satellite band changes. Digital audio and local radio broadcasting updates. Roger Bunney reports

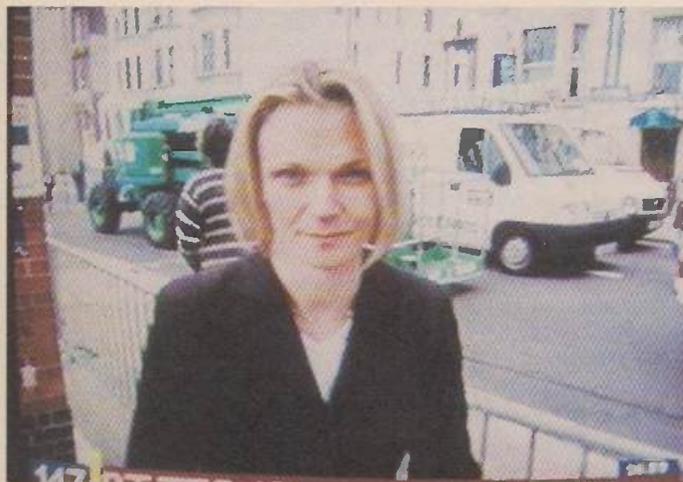
DX and Satellite Reception

This year's Sporadic E signal propagation season has at last arrived, and during the period under review there was some excellent reception. This time it has tended to be along a north/south axis, with signals from Scandinavia and Italy/Spain predominating – as yet there have been no exotic SpE signals. Here's a summary of reception noted during May:

- 12/5/01 SVT-1 (Sweden) chs. E2 and E3.
- 13/5/01 RTL+ (Hungary) ch. R2.
- 14/5/01 RAI (Italy) ch. IA plus unidentified signals in ch. E3.
- 15/5/01 TVE (Spain) chs. E3 and 4.
- 19/5/01 SVT E2-4; RAI IA, B; TVA (Italy) E3-; plus unidentified ch.R2 signals.
- 23/5/01 RAI IA, B; TVA E3-; Tele-A (Italy) E2-; TVE E2; RTL+ R2; SVT E2-4; ORT (Russia) R2-4; LTV (Lithuania) R2; NRK (Norway) E2-4.
- 24/5/01 TVE E3, 4; RAI IA, B; Video (Italy) E2; RTP (Portugal) E3; RTL+(France) L2; also many unidentified signals.
- 27-8/5/01 TVE E4.

There was enhanced tropospheric propagation on the 22nd and 24-26th, with reception of Band III and UHF signals from Germany, the Benelux countries and Denmark (chs. E7 and E10) in SE England.

My thanks to Peter Schubert (Rainham), Cyril Willis (King's Lynn) and Dave Philpotts (Looe) for their reception reports to supplement my own loggings. Note that the vision carrier for Tele-A (ch. E2-) is at 47.9MHz. With the frequently-received TVA



Regional ITV insert for Meridian Tonight, via Intelsat 801. The report related to a Southsea guest house that was collapsing into the street.

transmissions in ch. E3 – the vision carrier is at about 54.09MHz.

An e-mail from Hugh Cocks (Algarve, Portugal) reports reception of Brazilian 6m amateurs during May evenings, also Brazilian police signals at up to 47.1MHz. He caught a "brief flash" of ch. A2 video with American sound. If your reception is not too badly affected by 49MHz 'low-power' devices, it's worth checking for ch. E2 signals from the south.

There are rumours that TVE (Spain) will close its VHF TV transmitters later this year, moving to UHF only transmission. More on this next time. It will be a sad loss for many Band I DX-TV enthusiasts, who gained their first experiences of SpE reception from Spanish stations.

Skywaves, issued by the British FM and TV Circle, reports that the Azerbaijan ch. R1 transmitter is now being used for the Turkish TRT-1 service. Azerbaijan TV1 and TV2 continue to be transmitted in chs. R3 and R5 respectively. In the Seventies I received signals from the Baku ch. R3 transmitter using just a Band I dipole: fortunately the 'Baky' identification slide was being transmitted at the time!

Satellite sightings

With the arrival of summer and a break in the rain the regional ITV companies have been using their leased satellite-uplink BT truck time in the open air most evenings. On May 24th for example Meridian's weatherman Carl Tyler was seen in shirt sleeves and rolled up trousers in the sand by Bournemouth pier, joking with local kids, then predicting the forthcoming bank holiday weather (truck TES-43, at 10.988GHz V, symbol rate 5,632, FEC 3/4). Meanwhile Anglia's TES-42 (10.983GHz V, SR and FEC as above) was seen in a sunny gravel pit. Meridian's Maidstone SNG truck, TES-9 (10.974GHz V, same SR/FEC), made a rare excursion to a pub in Hastings on April 30th. These regional ITV links all use Intelsat 801 at 31.5°W, and always use the same frequencies. Signal levels are marginal. When there is rain, reception with my 1.2m dish produces pixellation, though the RSD digital receivers I used are not renowned for their low digital-threshold performance! Meridian studios use 1.8m dishes on the roofs.

Good news for PGA golfing enthusiasts. With the threat that all future PGA tournaments will be encrypted, it's pleasing to see that matches have been carried in the clear by Globecast OB feeds (11.590GHz V) via NSS K (21.5°W). The BT Washington lease (11.489GHz H, 5,632 + 3/4) also often carries PGA action. During May I saw the Corning Classic, Mastercard Colonial and the Chick-Fil-A Charity Championships for ESPN (Chick-Fil appears to be a fast-food chain). Other sporting action included German tennis on May 26th via Eutelsat II F3 (21.5°E), at 10.969GHz H, uplinked from an NTL truck with the service identification NTL.MCE.2; and, reported by Roy Carman, a warm up for the Monaco Grand Prix via Telecom 2B (3°E) at 12.673GHz V, with the usual French SR 6,289 and FEC 7/8. The BBC London caption

and feeds have been seen via II F3 at 12.547GHz H, with SR 5,632 and FEC 3/4.

Reader Nick, in Sutton, often checks Hot Bird at 13°E. On May 21st he found North American Late at the APTN slot (12.590GHz H, 5,632 + 3/4), with a news montage for APTN subscribers to provide content for their own news bulletins. Subjects, in order, were the Middle East, Russia, clashes in Chile, a Russian treaty, Iraq, the Chelsea Flower Show, and a rocket launch in Kazakhstan. This was followed by a media entertainment slot, featuring the Cannes Film Festival and Pearl Harbour film clips, then a sports montage. A Latin American Update and ABC World News Tonight followed, then this typical feed ended. APTN often uses the 12.581GHz H slot, so there are two frequencies to check.

While checking the Astra 1 slot (19.2°E) on May 9th Edmund Spicer (Littlehampton) found a news feed in the clear at 12.363GHz V (SR 27,000, FEC 3/4). There were colour bars with the Canal Sat identification inlaid, and a 1kHz tone. Edmund suggests that radio enthusiasts may care to tune to Radio Caroline at 11.875GHz H (same SR/FEC).

Using his Sky digibox with its as-supplied digital parameters, Sean Bateman (Coalville, Leics) found Globecast test cards (11.681GHz V, transponder D12), NTL test cards (11.594GHz H, transponder D13) and Czech Republic TV and radio (12.607GHz H, transponder F3S) via Astra 2/Eurobird at 28.2°E.

Another analogue channel has gone digital. TV4 Sweden has left Sirius at 5°E. The new digital transmissions are from Thor (0.8°W), at 11.389GHz H.

Broadcast news

Ireland: RTE is about to sell a 70 per cent stake in its transmitter/distribution network to a new company, Netco. The latter will sell transmission time to RTE and TV-3 and will be responsible for constructing a new digital terrestrial transmission network. The transmitter sites/masts will also be offered for mobile communications use. Currently RTE and TV-3 analogue TV, and commercial radio, are transmitted from some 126 sites. **Austria:** The BDXC reports that the Jauerling ch. E2a ORF transmitter will close by the end of the year. In recent years the transmitter has served mainly as an RBR (rebroadcast relay) feeder.

Lebanon: Terrestrial broadcaster Tele-Liban has resumed its TV service, concentrating on news and current affairs.

France: The TF-1 TV group plans to launch a six-channel digital multiplex. This depends on a rule that limits companies from owning more than a 49 per cent interest in new DTT channels being relaxed.

New Zealand: The government is to remove control of the transmission network from the NZBC and create a new company to run the communications system. The government is also financing a Maori TV channel which is expected to open later this year, using English and Maori languages.

Malaysia: Channel U is now on air, broadcasting from Kuala Lumpur in Mandarin Chinese, with plans to expand across the country.

Satellite news

NewSat-USA has bought the Palapa B2R C-band satellite and moved it from 108°E, where it provided a service to Indonesia, to 42.5°E, where its widebeam coverage will extend from China to the UK. Capacity will be offered at "extremely competitive prices". With InterSputnik offering single-transponder C-band capacity at US\$1m a year, it looks like bargain time in the Clarke Belt.

The Luxembourg SES-Astra group has bought GE American Communications for US\$5m. The new group, called SES-Global, will own 28 satellites with part-ownership of a further thirteen.

Another news channel, called TA3, is due to open this autumn. It will provide a service for Czech and Slovak viewers during the hours 0700-2400.



CBS taking an OB programme from the Castle Donington circuit.

PanAmSat has signed a deal with the US sports group ESPN. It will provide transmission via PAS-1R at 45°W and PAS-7 at 68.5°E, hopefully in the clear.

The Australia Television International service that served SE Asia via the Palapa C2M satellite at 113°E until it closed on March 23rd is expected to reopen with funding provided by the Australian government.

DAB update

According to some media pundits digital audio broadcasting (DAB) could take over from analogue radio by 2015. If the public's acceptance of DTT is anything to go by, this seems rather

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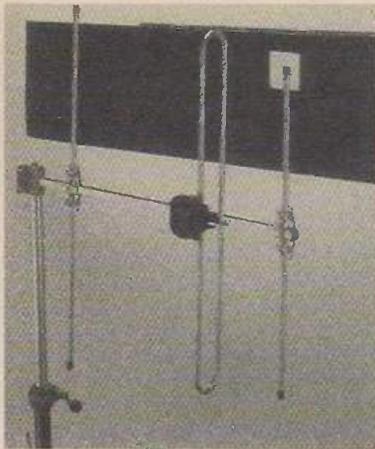
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unlikely. The DAB multiplexes are being transmitted at the top end of Band III, between 217.5-230MHz, with the BBC multiplex at 225.648MHz. This applies nationwide. If you are driving from Land's End to John O'Groate, leave your Pioneer car radio tuned to the BBC multiplex in Cornwall and you will receive the service without retuning until you arrive at Wick – at least this will be so once full DAB coverage along the route has been established. The spectrum includes a commercial national multiplex and five local radio ones – the Digital One multiplex at 222.064MHz.

DAB uses Musicam digital compression with COFDM modulation. In addition to stereo or mono broadcasting, the multiplexes carry data, text and paging information. The European DAB standard was established by the Eureka 147 design team and has been adopted throughout the EBU area.

The Radio Authority is supervising the expansion of DAB in the UK. As more multiplexes become available, local and regional radio services will be given digital channel allocations. For example the BBC Scottish service Radio Nan Gaidheal is to be carried by the central Scotland multiplex awarded to Switch Digital, while Radio Sheffield will be carried by the South Yorkshire multiplex awarded to Emap Digital.

This is obviously of great interest to mobile users, but there is little incentive for households to trash their FM tuners and Band II aerials and buy a DAB equivalent at perhaps £300 plus the cost of a new Band III aerial. The commercial broadcasters and the BBC are therefore offering additional programming as an incentive. It has been suggested that once demand has increased and cheaper dedicated chipsets have become available the price of a DAB tuner could fall to the £100-£130 level. A timescale of about eighteen months has been suggested.

The BBC proposes to provide the following: BBC World Service; Five Live Sports Plus; BBC Asian Network plus local optouts; an archive music channel of the late Nineties; a channel of music, news and talk for young audiences; and a mix of drama, comedy, stories and features. It will be interesting to see whether the public will be tempted.



An 0.3W Band II FM transmitter used for local community broadcasting in New Zealand.

DAB transmissions have slowly spread north and west across the UK, a pattern similar to the early spread of radio and the 405-line TV services. The BBC and Digital One DAB services currently reach about 75 per cent of the potential UK audience. This should rise to 85 per cent by autumn 2002.

Transmitter powers are much lower than with the VHF/FM services. For example whereas the FM transmissions from Wenvoe are at 250kW ERP for each service, the DAB output is at 9kW per multiplex.

There's lots of information on DAB available via the internet, including a glossary of digital terms. Check the following:

www.bbc.co.uk/digitalradio/information

www.bbc.co.uk/enginfo

www.radioauthority.org.uk

www.itc.co.uk

www.ukdigitalradio.com

Local radio broadcasting

The radio licensing authorities in the UK cannot be said to encourage very localised broadcasting. The fee for a licence, whether an LPAM or an RSL, that allows you to transmit for a relatively short period can run to thousands of pounds.

LPAMs are 'long-term' RSLs, lasting for up to five years. They enable a small MW transmitter to be used, running at a maximum of 1W into an inefficient 10m high radiator, sufficient to cover the authorised local area. They are issued to universities, hospitals etc. With specialised equipment however reception is possible at up to 100 miles.

The St. Richards Hospital, Chichester station CHR is an example, transmitting at 1,431kHz. It provides an excellent service with music, hospital and local news for the staff and patients. Clear reception westwards extends for six-seven miles – there has also been a DX report of reception in Guernsey!

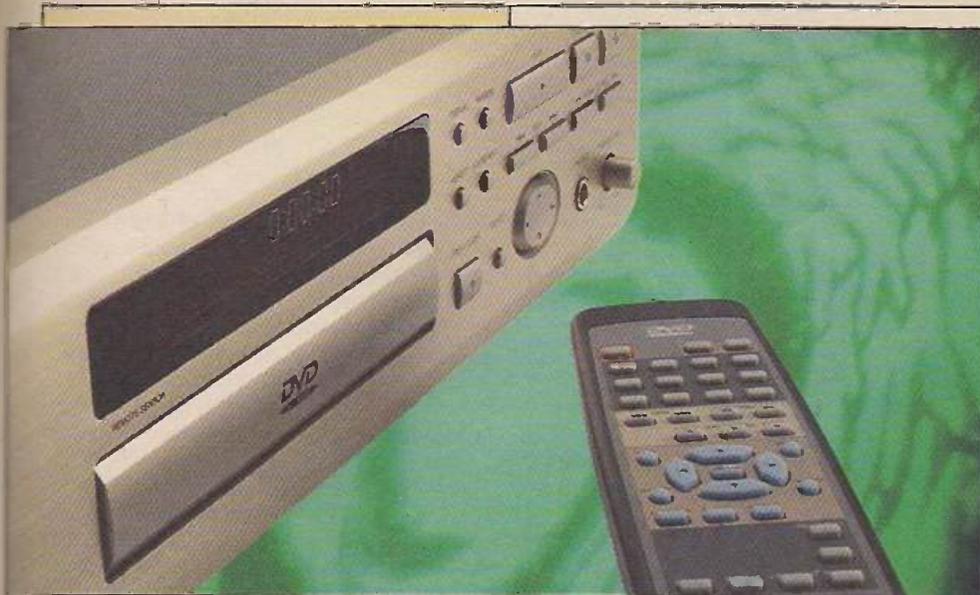
The better-known 28-day RSL usually allows a 25W VHF/FM transmitter to be used, with vertical polarisation. Again there are restrictions, such as the use of a half-wave dipole mounted no more than 20m above the local terrain. This VHF equipment is usually hired from a specialist company as a complete package, though firms such as Spectrum Communications (Dorchester) can supply mono and stereo 25W VHF transmitters for less than £1,000 (check at <http://members.tripod.co.uk/spectrum>).

In the UK you must go through the licensing procedures with the money up front. Other countries are less restrictive about low-power transmissions. The May 2001 issue of the NZ trade magazine *SatFACTS* provides details of the 88-88.5MHz and 100.2-100.8MHz bands there, where you can transmit up to 0.3W provided a government-approved transmitter feeding a unity-gain aerial is used. Typical uses include 'tourism radio', a local programme service with descriptive talk in one or more languages, using two or more transmitters; one-day concerts; and even estate-agent services for their clients who are driving around the neighbourhood house hunting. A well-positioned transmit aerial can provide coverage over a ten-mile radius.

The inForM Radio Model MR400 can be hired for \$NZ30 a week to provide such a service. It runs off the mains or a 12V standby battery, and can achieve an output of 0.5W into 50Ω. It's switchable in 100kHz steps across the FM band, with a typical deviation of ±100kHz. Bob Cooper tested it in the Auckland area. He found that with an aerial 100ft above ground level the coverage extended to over 15 miles, though an obstructed path reduced this range considerably. At 0.3W output there are likely to be lots of holes in the coverage area. It's an unusual broadcast unit which cannot be used in the UK.

Another advertiser in *SatFACTS*, Avcom-Ramsey, offers a 'complete FM station in a box'. This is an upmarket item that provides an output of 40W, is fan-cooled, has excellent bandpass filtering and an active-output aerial matching system – it powers down if the matching dies, saving your output stage!

My thanks to *SatFACTS* for this information. ■



DVD FAULTS

Reports from
Geoff Darby
D.M. Thomas and
Robin Beaumont

We welcome fault reports from readers – payment for each fault is made shortly after publication.

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or e-mailed to:
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Samsung DVD709

“Won’t play discs” it said on the job card. In fact it would play audio and video CDs but, when asked to play a DVD, it ran the disc up, went to play, then to stop and finally ejected the disc with the rather cryptic on-screen messages “this disc cannot be played” and “please check the disc”.

A quick call to Samsung produced the simple answer. There’s a PAL/NTSC/SECAM selector switch on the rear panel.

With standard region 2 discs this must be set to PAL. The unit needs to be unpowered and repowered after setting this switch, as it is checked only once at power-up reset. Presumably owners believe that by setting this switch to NTSC the machine will play region 1 discs from the US. Once they’ve set the switch and repowered, the machine won’t go back without removing the power again.

Apparently the same symptoms can be caused by the owner trying to hack the region software with an Aiwa hi-fi remote control unit. To return the equipment to the factory default condition, power up without a disc inserted. Wait for the “no disc” message, then press and hold the stop and play keys together for four seconds. You then get an on-screen message asking for “language”. Use remote-control key 1 to select English. The system is then reset and should work normally.

How nice to deal with a technical department that knows what it’s talking about, offered additional useful information, and didn’t treat me like something they’d just scraped off their shoe. Well done Samsung! G.D.

Philips DVD955

The laser unit in this player has to be replaced as a complete block. Note however that it is a dual-laser optical block, and because of this there are two laser diode shorting points. One of these, across the CD laser diode, is obvious. The one across the DVD laser diode is much less obvious. It’s located between a minuscule pair of surface-mounted devices and the only screw on the top of the optical block. If you miss this one the unit will play CDs but not DVDs. G.D.

Sony DVP-S315

“Done up like a kipper” is the phrase that comes to mind. Don’t be, as I was, when I got one of these players with the complaint “no display”. In the set-up menu, several

layers down, there’s an option entitled “display”. It has three settings, bright, dim and, you’ve guessed it, off! G.D.

Pioneer DV-606

“No open, no close, no play” was the reported fault with this DVD player. A nice simple one for a change. Protector P211 in the power supply had developed high resistance. A check on the maximum current demand from this supply showed that it peaked at just 700mA, well below the protector’s 1.5A rating. A replacement restored normal operation. G.D.

Proline DVD1000

When this machine had been playing for ten-fifteen minutes mosaic-type blocks (macro blocking) would appear on the screen. It was also noticed that IC4/5/6/7 got very hot. The cause was IC2, part no. THAKSG5KP1010.

With another of these machines the picture would freeze then stop, after which there were no functions. This time IC3 (SG7LM431) was faulty. Its part no. is THAKSG7LM431. D.M.T.

Panasonic DVDA370EN

The owner had brought this unit from the Far East. Fortunately, apart from the lack of a scart socket, it seemed to be identical to the UK Model DVDA360EN.

The sled drive motor appeared to be in trouble. If the pickup was moved away from the rest position it returned only very slowly, and the motor was noisy. Good results were obtained once a new sled motor assembly, part no. VEM0666, had been fitted. R.B.

Samsung DVD709

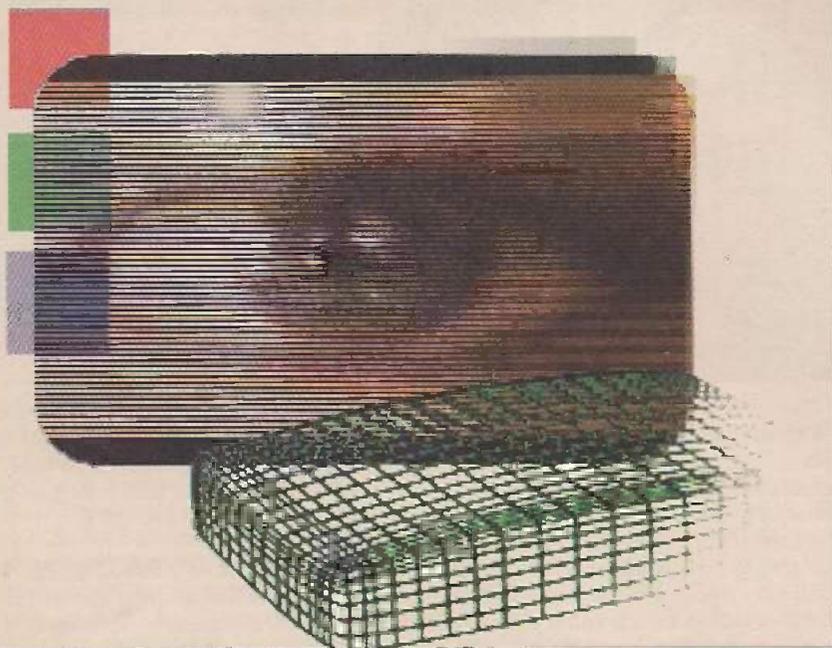
This machine attempted to focus and spin but wouldn’t play any disc. A new optical pickup was required. This is supplied by Samsung as a complete assembly that’s easily fitted and doesn’t require any adjustment.

The unit was under guarantee. Our quote for a chargeable repair to another identical unit was refused as the cost approached the price of a new machine from the local supermarket! Another sign of the times. R.B.

Toshiba SD3109

Another DVD player with a faulty optical pickup, and again the manufacturer supplies a complete assembly that’s straightforward to fit. In this case mild panic set in because the symptom – failure to focus – seemed to remain exactly the same. I then spotted the transparent plastic film that was protecting the lens. Removing this and (of course) unsoldering the protective link for the laser diode completed another satisfactory repair.

This model has a twin-tray mechanism that’s similar to the one in Pioneer CD players. Be careful when dismantling, as the trays can jump out of line and make a simple job more difficult. R.B. ■



TV FAULT FINDING

Reports from

Michael Dranfield

Graham Boor

Gerald Smith

Larry Shelbourn

Graham Richards

Stephen Leatherbarrow

P. Salkeld

G.W. Roper

Ivan Levy, LCGI

Gary Laidler and

Martyn Davis, I.Eng.

We welcome fault reports from readers – payment for each fault is made shortly after publication. See page 618 for details of where and how to send reports.

JVC C14ET1EK (Onwa chassis)

This set worked all right for about five minutes then the colour disappeared. If it was left on for another half hour the monochrome picture would turn yellow. Unfortunately the service manual doesn't provide an internal block diagram for the AN5601K colour decoder/timebase generator chip IC301. With this lack of information it's impossible to guess what some of the pins are for. After wasting a lot of time carrying out scope checks I decided to check the voltages at all 42 pins. When I reached pin 12 I obtained a reading of 2.01V instead of the 5.1V shown on the circuit diagram.

This pin is connected to the 12V rail via a 2.2M Ω resistor, with an 0.47 μ F, 35V tantalum capacitor (C325) to chassis for decoupling. I suspected that the resistor had gone high in value, but I was wrong. C325 had been fitted the wrong way round from new! Once it had been turned around the fault was no longer present. How the set had ever worked correctly I don't know, nor why the fault had taken four-five years to appear. M.D.

Bush 2059NTX

There was patterning that swirled around in the background of the picture, but only when the set was cold. The fault symptom disappeared once the set had warmed up. It took me longer than usual to find the cause.

of the trouble, because the faulty component (C125) had checked OK with my ESR tester. When I eventually removed it from the PCB for test the ESR meter showed that it was open-circuit.

This 100 μ F, 16V capacitor smooths the output from the L7812 regulator IC103. You'll find it between IC103 and IC101 near the front of the PCB. M.D.

Amstrad CTV3121N

If one of these sets is stuck in standby, check R22 (0.22 Ω) in the power supply. In the latest of these sets to come our way it had risen in value to 3.6 Ω . As a result the 5V supply to the microcontroller chip was low. M.D.

Sharp DV3760H (4BSA chassis)

This set refused to start up: the front LED flashed orange briefly then returned to red. ESR tests in the secondary side of the power supply revealed that C604 (1,000 μ F, 16V), the reservoir capacitor associated with D602, was open-circuit. This rectifier circuit produces about 13.5V, which is fed to the 5V regulator IC1003. M.D.

Goodmans C210

This 10in. mains/battery portable was stuck in standby. The cause of the fault was traced to RP07, which is in the base circuit of the regulator transistor. It's advisable to check RP10 as well. These are both 330 Ω surface-mounted resistors. M.D.

Panasonic TC1785 (Z3 chassis)

This set would work for about five minutes then produce the dead-set symptom. The cause of the trouble was the STR50103 chopper chip IC801. A replacement cured the initial fault but introduced a new one: the chopper transformer made arcing noises intermittently and lines would flash across the screen. I then remembered that I'd had this problem before. Only a Panasonic-specification chip (STR50103A-M) will do. It costs about £15 plus VAT – cheap ones can be bought for £2.50. M.D.

Sharp DV51083H (D3000chassis)

The job sheet said "dead", which was a fairly accurate description. Checks showed that the power supply was producing an HT output, but I noticed a well discoloured capacitor here. C715 (1,000 μ F, 16V). A replacement cured the fault. C715 is the reservoir capacitor for the 5VM supply. G.B.

Panasonic TX21S3T

There was no TV sound though the set was OK with an external AV input. So the

audio output circuit was clearly OK. Checks showed that nothing was coming from IC601. A replacement restored the missing sound. **G.B.**

Sharp CS chassis

The top half of the picture was missing, with two or three lines only. The cause turned out to be the 18V surface-mounted zener diodes D501 and D502, which are connected across the inputs to the field output transistors. As a precaution I also replaced the field output transistors, Q507 and Q508. This restored a normal picture. **G.S.**

Sharp CS chassis

Noisy sound was the complaint with this set. When I checked I found that one channel was noisy both with a signal and with the sound muted. I tried replacing the relevant sound output and driver transistors, but this produced no improvement. The cause of this elusive fault turned out to be C369, which is the coupling capacitor between the driver and output stages in the right sound channel. **G.S.**

Finlux 3000 series chassis

These old-timers are still giving good results. If you get one with high brightness, but the OSD is at minimum, check De2 (1N4148) in the TDA3505 RGB processor section. You will find that it's short-circuit.

If you have poor field linearity (cramping) at the top, you will find that the 26.5V supply is low at about 23V. Check for dry-joints at Cz16 (470nF) on the deflection panel. It decouples the HT feed to the line output transformer and causes all sorts of problems, including Rz28 (1.5Ω) burning up. **L.S.**

Sanyo CBP2180 (A5-A21 chassis)

Picture shifted to the left, poor colour because of Hanover blinds, and the sound muted. A nightmare you might think! But check the horizontal shift control VR411. You will find that it's open-circuit. **L.S.**

Akura CX30

There were two problems with this set, field collapse and failure to change channels. The KA2154 multi-function chip had already been replaced (with a TA7698AP equivalent) by another engineer, to no avail. In fact the cause of the field problem was failure of the scan coupling capacitor C311 (220μF, 35V) – it had gone open-circuit.

The lack of channel changing wasn't in fact a fault. All 31 channels had been put into the 'skipped' mode. Retuning and a

lot of unskipping was all that was required. **G.R.**

Hitachi C2509T (G7PS chassis)

For bottom cramping, replace the field scan coupling capacitor C606. The original capacitor is 680μF, 16V. It's best to fit a 1.000μF, 25V, 105°C type. **G.R.**

Ferguson 51K3 (TX99 chassis)

The symptoms were a blank, snowy raster; stuck on ch. 1; and the remote-control system not working (except for the text button). The cause of the problem was loss of the input to pins 19 and 20 of the M494F memory chip IC241 because the 33V regulator IC243 was faulty. It's type μPC547 and also, of course, provides the tuning supply. **G.R.**

Bang and Olufsen 3726

If one of these sets is stuck in standby, check C29 (100μF, 63V) which decouples the supply to the line driver stage. This particular set also had a black band across the picture when it was first switched on. Electrolytic capacitors were again the cause, this time C44, C45 and C47 in the field timebase. They are all 100μF, 63V. It's best to fit the 105°C type. **G.R.**

Bush 1433 (11AK20M-3 chassis)

This yellow portable tripped at switch on. It didn't take me long to find out why: the rectifier diode for the 200V supply to the RGB output stages was short-circuit. It's D604, and it had a strange number on it. I fitted an RGP15, after which the pictures were fine – even though the cabinet colour wasn't! **G.R.**

Goodmans 2575

Intermittently reverting to standby was cured by fitting new electrolytics in the circuitry on the primary side of the power supply, resoldering the usual chopper transformer dry-joints and resetting the HT level to 142V. **S.L.**

Sony KV14T1U (BE4 chassis)

The auto grey-scale lines were visible over the top of the picture. Otherwise the scanning seemed to be normal. After eliminating various suspects in the field circuitry I concentrated on the EPROM. A new ST24C02CB1 (1C002) cured the problem. **S.L.**

Bush 2867NTX (11AK12 chassis)

A dead set because the chopper transformer is short-circuit is a common fault with this model. The replacement trans-

former comes as a kit, with an Eldor switch-mode power supply device, part no. 30004541. Two further components need to be fitted when this replacement is used, R812 (47Ω, 1W metal oxide) and C809 (220nF, 63V MKT). **S.L.**

Sharp DV5131H (S3B chassis)

One of these sets suffered from compression of the field scanning. The cause was C712 (100μF, 35V), which is the reservoir capacitor for the 25V output from the chopper power supply. **S.L.**

Mitsubishi CT2153STX (Euro 4Z chassis)

The problem was bright flashes, intermittent in nature but usually prevalent during the first hour or so after switch on. An electrolytic capacitor problem was at first suspected – after all it is a Mitsubishi set – but my eyes were drawn to glue on the RGB panel. It had blackened and had all but eaten through a track. Removal and track repair provided a cure. **S.L.**

Mitsubishi CT1525TX

The standby light glowed but that was all. A check on the line output transistor Q552 (2SD1877) showed that it was short-circuit. Dry-joints on the line driver transformer T551 are a common cause of Q552's failure, but the transformer had already been resoldered.

I decided to run the set with a 60W bulb connected between the collector of Q552 and chassis. After ten minutes I noticed that the bulb's brightness was changing. This meant lack of regulation in the power supply. The cause was the STR54041 chopper chip IC901. **P.S.**

Thomson W7023U (ICC17 chassis)

A dead set with a front LED that blinks twice followed by seven blinks indicates that the set is in the protection mode. On investigation I noticed hard, brown gunge around the core of the line output transformer. This was the cause of the problem. The replacement came as kit no. 35123670, which includes a number of other parts that have to be changed. Once this had been done the set sprang to life. **P.S.**

Bush 2857NTX

All that this set produced was a small, fluctuating raster in the middle of the screen. The cause was the HT smoothing capacitor C924 (22μF, 250V) which was open-circuit. **P.S.**

Panasonic TX21GV1 (Z421V chassis)

When this TV/video combi set had been

on for a couple of hours the remote and on-board controls would lock up. I called Panasonic and was told to replace the infra-red sensor, part no. KRT30. Spot on, Panasonic! The new sensor had the letters 3F printed on the back. The old one had 36 printed on it. P.S.

Bush 2871NTX

These sets are just coming out of the guarantee period. This one was dead with the 2.5A mains fuse F801 blown. I also noticed that the mains filter choke TR801 had been burning. The cause of all this was excessive ripple because the mains bridge rectifier's reservoir capacitor C804 (220µF, 450V) was open-circuit. P.S.

Sony KVM1420 (BE2A chassis)

When the set had been running for a couple of hours the picture would become dim, as if the contrast control setting had been turned down. Use of freezer and a hairdryer led me to the culprit, which was CA021 (22µF, 50V). When I took it out it produced a strange, pungent smell. P.S.

Grundig T55-730 (CUC7301 chassis)

At switch on the LED glowed briefly, went out and then came on again. When the picture appeared the field linearity was very bad: the top third was badly cramped with a bright line at the bottom, the linearity over the remaining two thirds of the picture being reasonable. The width was slightly reduced, and the HT was low at 100V.

I tried to run the power supply with a dummy load, but it wouldn't work in this way. I next tried disconnecting the supply to the TDA3653B field output chip IC400. The HT rose to 124V and the off-load supply to IC400 was 28V. After checking various components associated with this IC I decided to try a replacement. The results were exactly the same.

To check whether it really was a field fault I fed the TDA3653B chip from my bench power supply. The field linearity was then good. Realising that I should have stayed with the power supply, I checked various resistors and found that R666 and R667, which should both have been 0.82Ω, had risen in value to 1.5Ω and 1.7Ω respectively. They are in the MJF18004C chopper transistor's emitter circuit.

Note that with this chassis the HT depends on the type of tube fitted. Also that the value of R666 and R667 may be 1Ω, again depending on type of tube. G.W.R.

Ferguson M7073GH (TX92 chassis)

This set kept changing channels, then switching between AV inputs. I found that the relevant output ports of the microcon-

troller chip IR01 were pulsing one after another, though there was no keypad or IR sensor input. The cure was to resolder the connections to IR01. I.L.

Mitsubishi CT25M3TX (Euro 12 chassis)

There was no picture, just a blank screen, and no tuning. There was a picture when a scart input was used however. The EEPROM memory chip IC702 (X24C04P) turned out to be faulty. I.L.

Ferguson T59F (TX92 chassis)

This set came in dead with a short-circuit line output transistor. When I switched it on after fitting a replacement the set worked correctly for about five minutes then the picture jittered horizontally and the line output transformer caught fire. The set was OK, proved by a lengthy soak test, once a new transformer and transistor had been fitted. I.L.

Goodmans 286NS/05 (Philips L6.2 chassis)

Two of these sets have been brought in recently. The first one was dead with no light from the front LED though a faint whistle came from the set. My first thought was Philips blue disc capacitors, but I was wrong. Checks in the power supply revealed that the output from Tr7505 was low at only 1.2V instead of 5V. A new BC337-40 transistor restored normal operation, though the old one seemed to be OK when checked out of circuit.

The second set was also dead with a faint whistle, but this time the LED was on. After a lot of checking I found that fuse F1502 (63mA) on the secondary side of the power supply was open-circuit. A replacement restored the picture and sound, and a long soak test proved that the set was now OK. G.L.

Toshiba 2112/2512/2812DB

I've had field collapse several times with the various sets that use this chassis. Now, instead of jumping in and replacing the field output chip, I use a scope to check for drive at pin 32 of the TA8783N colour decoder/timebase generator chip IC501. You will often find that it is missing. It's worth ringing round for this chip as the price can vary wildly. At the time of writing the cheapest quote I could obtain was from CPC. G.L.

Akai CT2159 (Onwa chassis)

After carrying out a standard power supply repair in this set there were spurious field faults - lines at the top etc. All were cured by replacing the following capacitors: C417 (220µF, 16V), C423 (2,200µF, 25V) and C435 (470µF, 16V). M.D.

Sony KV28FX20 (BE3E chassis)

This set refused to change channels

unless the menu button was first pressed. The cause was a corrupted EPROM chip. Re-initiating the autotune process restored correct operation. M.D.

Thomson 32WS23U (ICC17 chassis)

This set tripped three times then died. A new line output transistor and transformer were required to restore normal operation. M.D.

Mitsubishi CT21A2STX (Euro 12 chassis)

This set had been slow to come on because C906 (47µF, 50V), which couples the drive to the chopper transistor, and C920 (100µF, 15V), the reservoir capacitor for the supply to the slave chopper control chip IC901, were in need of replacement. The customer ignored my advice that they needed to be replaced and, as a result, when the set eventually failed I had to replace IC901 (TEA2261), the chopper transistor Q901 (2SD1887) and the field output chip IC451 (TDA8178S) as well.

This last item is no longer available. The solution is to fit type TDA8171 and replace C457 with a series-connected capacitor and resistor, 0.22µF and 1.5Ω respectively. These components are available as a kit, no. H27P014020. M.D.

Sanyo 21MT1 (EC3-A21 chassis)

This set produced a very poor quality, flickering picture. Scope checks around the TDA8361 IF/colour decoder/timebase generator chip IC101 showed that there were virtually no RGB outputs at pins 18-20. A new chip restored the picture. M.D.

Sharp 66E503 (CA10 chassis)

A common fault with this chassis is failure of the line output transistor because of a dry-joint at C613. Usually all that's needed is a touch of solder and a new transistor. In this case however the line was then under-scanned by about four inches and the output transformer was running rather hot. After fitting a new transformer and carrying out extensive waveform checks I was no nearer a solution. All the service-mode functions, which are accessed by pressing volume down and channel up while switching on from cold, were working.

I decided to carry out a block replacement of the capacitors and diodes in the EW diode modulator circuit (C608, C610, D603 and D604), and subsequently found that C608 had gone low in value.

Incidentally all Sharp TV sets with a Philips tube should have the line scan coil connections on the small board on top of the deflection assembly resoldered.

Other common faults with this chassis include stuck in standby (check R704/705 or R713/714) and faulty field scanning (check F601, F602). M.D.



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Please allow up to 28 days for delivery

Specifications

Switch position 1

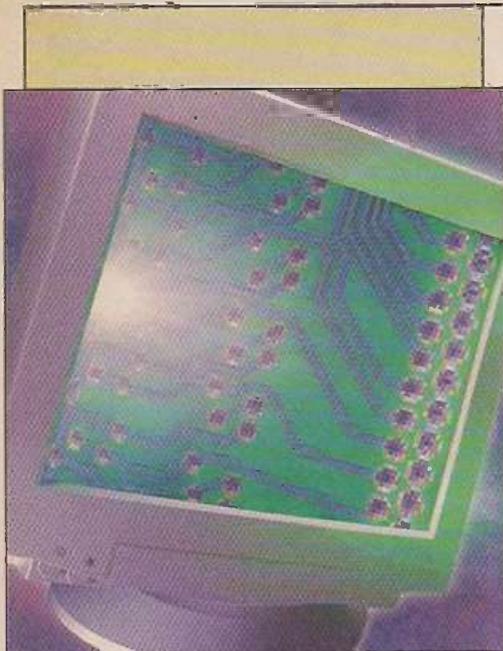
Bandwidth	DC to 10MHz
Input resistance	1MΩ – i.e. oscilloscope i/p
Input capacitance	40pF+oscilloscope capacitance
Working voltage	600V DC or pk-pk AC

Switch position 2

Bandwidth	DC to 150MHz
Rise time	2.4ns
Input resistance	10MΩ ±1% if oscilloscope i/p is 1MΩ
Input capacitance	12pF if oscilloscope i/p is 20pF
Compensation range	10-60pF
Working voltage	600V DC or pk-pk AC

Switch position 'Ref'

Probe tip grounded via 9MΩ, scope i/p grounded



MONITORS

Fault reports from

Tony Mathews

Ken Hodgetts

Gerry Mumford

Duncan Newell

A. Rawson-Williams and

Ian Field

We welcome fault reports from readers – payment for each fault is made shortly after publication.

Reports can be sent by post to:
Television, Fault Reports,
Anne Boleyn House,
9-13 Ewell Road,
Cheam,
Surrey SM3 8BZ

or e-mailed to:
tessa2@btinternet.com

Mitsubishi Diamond + 73

This monitor was dead with no discernible activity in the power supply. As I didn't have the circuit diagram I decided to check the obvious things first and soon found that C109 (22 μ F, 35V) on the primary side of the power supply was very low in value. A replacement restored the monitor to life. T.M.

Mitsubishi Diamond Scan 90E

No screen display was the complaint with this monitor. The front-panel LED glowed green and, listening carefully, I could hear the EHT start up. This is becoming a common fault: the CRT PCB has double-sided print, and the rivet that connects the heater supply from one side of the board to the other fails. A more reliable repair is to hard-wire the supply from the rivet to the relevant pin on the CRT socket. T.M.

Eizo F56

Three of these monitors came in recently. Two had no red in the display, the other one no blue. In all three the VP453 RGB output IC had failed. The pins to check are as follows: pins 5, 7 and 15 should be at approximately 98V; pins 8, 14 and 4 are the R, G and B outputs respectively; pins 10, 12 and 2 are the R, G and B inputs. T.M.

Mitsubishi Diamond + 71

This monitor was dead and a quick check at the 4A fuse showed that it was open-circuit. Expecting the worst, I was pleasantly surprised to find that C916 (1,000pF, 2kV) had failed. I replaced it with a 2kV type. A new fuse completed the repair. T.M.

Mitsubishi Diamond Pro 720

This monitor wouldn't come on: the front-panel LED was glowing amber and flashing on and off. Unlike some others I can think of, this model is not too bad to take apart. When the PCB had been removed a quick check at Q504 proved useful. This 2SC5587 transistor and Q509, which is type 2SJ512, were both short-circuit. The 1 Ω fusible resistor R523 usually fails as well. Replacing all three components then resoldering some suspect joints completed the repair. T.M.

Dell D825HT (Ultra scan 800HT series)

When this 14in. monitor was switched on the EHT rustled up and the indicator came on, but there was no raster. The CRT's heaters were alright, so I advanced the setting of the first anode control. There was

still no sign of a raster. Checks on the CRT base PCB showed that a large 2.2M Ω resistor that feeds the first anode was open-circuit. A replacement restored normal operation. K.H.

Philips 17C2321N

This monitor powered up with a green LED which quickly went to amber, but there was no screen display. Inspection revealed massive dry-joints on power devices 7621, 7622 and 7805. They are mounted in a vertical line towards the back of the chassis, all bolted to the same large heatsink bracket, so they are easy to find. G.M.

Olivetti DSM60-400

The problem was loss of green in the display. Checks showed that there was no supply to the green video driver transistor Q932 because the associated transistors Q933 (BF423) and Q934 (2SC1845) were short-circuit, along with D934 (unmarked – use type 1N4148). As a result R934, R935 (both 33 Ω , 0.125W) and R939 (100 Ω , 0.5W) had all burnt up and gone open-circuit. Replacement of these components restored a perfect display. G.M.

Viglen CA1426LT

This monitor was totally dead, with the power supply shut down because the 2SC3886A line output transistor Q312 was short-circuit. Note that power supply shut-down is achieved by killing the supply to the UC3842 chip externally rather than using its internal excess-current protection features, so this design will never exhibit the usual tripping symptom. The reason for Q312's demise was that the 5.6nF, 1.6kV line output stage tuning capacitor C322 had bulged and split open. G.M.

Tatung TM3401 (and others)

Various colour problems with these Tatung monitors can be caused by a faulty signal cable. The cable is made by JI-HAW and should be replaced. I've had to replace a number of them in the past. D.N.

GVC M1448

This monitor was dead with no power. The following items were replaced: FS101 5A; DZ101 BZX85 18V; R105 10 Ω ; D105 UF4007; D121 UF5408; U101 3842; Q101 2SK1117 or 2SK1118. D.N.

Apple M2935

This Apple 1710 16-in. multi-scan monitor is fitted with a Sony Trinitron tube. It was dead though the front power-on LED was glowing. The power supply

seemed to be working all right, but there was no HT at pin 8 of the line output transformer. I found that RL59 (1Ω fusible), RL68 (4.7kΩ), RL115 (6.8kΩ wirewound) and QL12 (type IRF9630, on its own heatsink) were all open-circuit. These items are on the motherboard, under the CRT base PCB. They can be replaced with some difficulty without removing the PCB, in this very awkward monitor to service, by soldering through the holes in the bottom metal screening can. QL12 is the regulator for the HT supply to the line output stage, its output depending on the line sync rate or monitor mode. The line output transistor is type BU2520DF.

If the monitor is dead with the 3-15A mains fuse F901 blown and signs of sooting around the pins of the STRS6707 power supply chip IC901, check C916 (1,500pF, 800V) which is located inside IC901's metal-box heatsink. This capacitor may check OK in circuit but, if removed and inspected, you may find a crack in its casing; it will break down when a pulsed voltage is applied to it. **A.R.W.**

Apple M1298

This is a 16in. SVGA multi-sync monitor with Sony FST Trinitron tube. If you get one that's dead with not even the power LED lit, check the 3-15A mains fuse. It's located at the back of the chassis, to the side of the mains input plug, in a very awkward place to get to and seems to blow with the slightest mains surge. **A.R.W.**

IBM 07G9961

This monitor is a more modern replacement for the 8515. It was manufactured in 1992 by Samsung to IBM specifications. If you get one that's dead with a high-pitched whistle coming from the switch-mode power supply, check for a short-circuit line output transistor (Q306, type SGSIF444 or S2000AF). The cause is usually the line output stage tuning capacitor C313, which may be short-circuit or have a dry-jointed connection to one of its legs. **A.R.W.**

IBM 59G9978

This is a 14in. SVGA monitor manufactured by Samsung. If you get one that's dead because the power supply won't start up, check R603 and R618 (both 270kΩ, 0.5W). They tend to go high-resistance or open-circuit. **A.R.W.**

IBM 6540-02N

The complaint with this monitor was "works OK – except it smokes"! When I applied power there was no sign of life,

with or without smoke. As there was no evidence of catastrophic failure on the primary side of the power supply, I decided to see what activity there was around the 3842 control chip. Pin 7 had a fairly normal-looking voltage that was pulsating – evidence that the power supply was trying to start. This usually means that there will be corresponding bursts of pulses at pin 6, but as they are very narrow they can be hard to detect. No pulses here can be caused by a faulty 3842 chip, a short-circuit gate protection diode, or a faulty chopper MOSFET. It can also mean that pin 3 has been forced above 1V or the voltage at pin 8 has been pulled low by an external shutdown circuit.

Q808 (2SA733) is mounted near to the chip with its collector connected to pin 3 and its emitter to pin 8. It was not necessary to investigate the circuitry that switches this transistor on, because its hold-off bias had failed. This is provided by R806 (160kΩ) and R807 (150kΩ). Don't confuse these resistors with the nearby start-up resistors.

A detailed examination of the chassis, including the removed faulty resistors, failed to reveal the cause of the alleged smoking. **I.F.**

Project/CTX1565D

Most of the front buttons either didn't work or were erratic. For most of the time only the shift buttons worked, but the picture would usually jump back to its previous setting as soon as the button was released. There was a scrap panel in the 'graveyard', and as both the 24C02 EEPROM and the front-panel microcontroller chip are socket mounted it was easy to swap them over. Neither swap made any difference, so I tried swapping over the 8MHz crystal. This cleared the fault.

Some time later an identical monitor arrived with very similar symptoms. Easy, I thought! Not so: changing the crystal made no difference this time, neither did swapping over the EEPROM or microcontroller chip. Closer examination of the front-panel buttons revealed that the tact switches all had a distinct click, except the far right (recall) button.

The front-panel button switches are mounted on a sub-panel that's screwed to the inside of the front surround. I found that slightly slackening the mounting screws restored the normal 'click' to all the buttons. Without giving it too much thought I glued a spacing washer to the sub-panel to space it back on its mounting post. This worked fine, without any detrimental effect on any of the other buttons, but I did

wonder afterwards whether I should have unsoldered SW12 and checked that it was correctly seated in its holes. **I.F.**

Digital PCXBV-BC

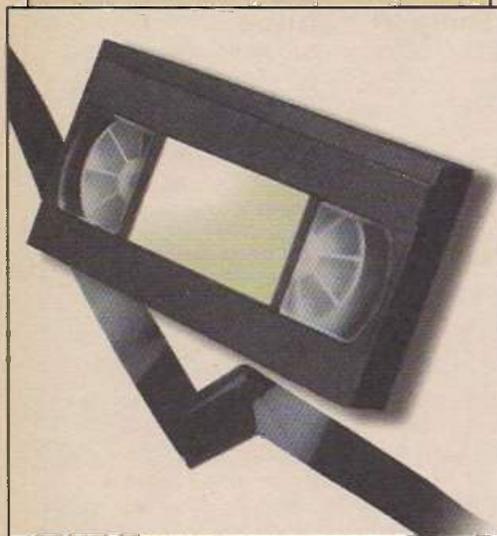
This monitor was making a return visit. On the previous occasion its line output transistor had failed, in turn damaging inductor L5613. The nearest coil I had been able to find for use as a replacement was one salvaged from a Samsung chassis: it was marked 139BA DHZC1. L5613 usually melts when the line output transistor fails, but on this occasion my replacement had survived without a blemish on it.

After careful consideration I decided that the most likely cause of the repeat line output transistor failure was a degraded input from the driver transformer (there was not much else I hadn't already checked!). Inspection of the associated components revealed that its supply smoothing capacitor C2614 (1μF, 250V) looked decidedly shrivelled. I replaced it, and as usual added the customary non-electrolytic capacitor in parallel to offset the ESR self-heating.

Since I was getting fed up with this particular monitor (this wasn't its first return visit) I decided to be really sure by upgrading the BSN245A line driver MOSFET. This device has an impressive specification, which is not easy to improve, for a tiny TO92 device. The RDS-on, 4.5W, isn't bad either. But the 2SK758's 0.7W is better. The different pin-out isn't a problem, since the PCB has an extra hole drilled in it to fit formed as well as in-line leads: so it's possible to form a 2SK758's leads to fit without the risk of shorting. The lower RDS-on ensures that the line drive squarewave has sharper edges. This was confirmed by the fact that the circuitry now ran much cooler. The B+ chopper MOSFET on the rear bracket usually gets quite warm: it was now running stone cold.

For severe loss of contrast, check for cracks in the PCB between pin 6 of the LOPT and resistor R3626. The damage is often caused by a lifted solder-land around connector M601, which is for one of the single wires to the CRT surround carthing/screening: it's often overlooked when the monitor is being dismantled, and gets pulled when the chassis is withdrawn.

The service manual I've been using is 4822 727 19602, PCS 42 332 GB, for the 4CM4270/00T/05T/06T-4CM4200/75T. Although there's nothing on the DEC monitor to link it with this Philips manual, everything I've looked up so far has been where the manual says it is. **I.F.** ■



VCR CLINIC

Reports from
Eugene Trundle
Ivan Levy, LCGI
Bob Meade
Martyn Davis
Graham Richards
Roger Burchett and
Chris Avis

We welcome fault reports from readers – payment for each fault is made shortly after publication. See page 618 for details of where and how to send reports.

Hitachi VTF540E

The intermittent symptom with this machine was a loop of tape left dangling from the flap when the cassette was ejected. The cause lay with the back-tension band whose felt strip was partially adrift, leaving its sticky backing plastic to adhere, sometimes, to the periphery of the supply reel. E.T.

Mitsubishi HS750V

This machine was dead with no fluorescent display and no cassette loading. I decided to check the output voltages on the secondary side of the power supply and found that the 6.5V line, at D9A2, was low. The reading was about 4V. A scope check then revealed that there was about 2V of ripple across C9A3 (1,000 μ F, 10V). A new capacitor cured the fault. That was the first occasion: I subsequently had the same fault three times in one month. I.L.

Mitsubishi HS851V

This faulty machine displayed the message E4. According to the manual this means that the tape reels have stopped moving. When I removed the mechanism I discovered that the reel photo unit had become dislodged. All that was required was to refit it and test. I've now had this fault twice. I.L.

Thomson 20CB25UT

This TV/video combi unit came into the workshop with a tape stuck inside. The TV section worked all right. The VCR wouldn't respond no matter what I pushed (play, stop, eject etc.). I had to take the mechanism out of the cabinet and eject the tape manually, using an external power supply. I then checked all the key switches to make sure that none were sticking. When I loaded a tape I found that all functions had returned to normal. I checked the mechanism thoroughly, reassembled the unit and put it to soak test for a long time. No further problems occurred.

Fitting the back panel can be tricky, mainly because the TV chassis is mounted at the side. The best way to fit the panel is to lay the TV face down, put a cotton-bud stick in the hole in the TV chassis, near the LOPT, then guide the rear panel over the cotton-bud stick. I.L.

Ferguson FV405HV

There was a tape stuck in this machine. I removed it manually then tried to load a tape, but the machine kept shutting down. The mechanism was checked out of the machine and found to be working correctly. The cause of the trouble was traced to the loading IC IT002, which produced a

low-impedance reading between pins 6 and 7. I.L.

Mitsubishi HS550V

This VCR appeared to be dead, though the output voltages from the power supply were all present and at the correct level. The cause of the trouble was dry-joints at the system control processor chip IC5A0. I.L.

Mitsubishi HS750

This machine would play a tape for exactly five seconds then eject the cassette. The light sensors (D5A9) are usually the cause of this. I fitted the LED sensor service kit, but this failed to cure the fault. A scope check then revealed that the sensor signal was present at the system control chip, IC5A0. As the data and supplies to this IC were also OK the obvious thing to do was to fit a replacement. It's a 100-pin, surface-mounted device, type M3818ME. This cured the fault. I.L.

Sanyo VHR291

This machine would work all right in the SP mode for about three-quarters of an E180 tape then shut down. In the LP mode the same thing happened about a third of the way through the tape. No, it wasn't the usual Sanyo/Sony PR512 problem this time! Replacing the infra-red sensor LED made little difference but, when the take-up spool was removed, I saw that the reflective black/silver underside was faded and dirty. An attempt to clean it wiped off all the surface! A similar reflective disc from a scrap machine, glued in place, provided a complete cure. B.M.

Panasonic NVF55

There was an intermittent horizontal line on the picture, about a quarter of the way down from the top. It was worse with pre-recorded tapes. A new head, I thought. So I obtained and fitted one, but it wouldn't even spin! After much investigation I checked the three 'Euro screws' at the middle/top of the head drum (bearing). They were all loose. Tightening them produced normal operation and, after normal alignment, perfect pictures. B.M.

Panasonic NVSD230B

This machine played tapes at approximately double speed. The fault was cured by fitting a new capstan motor, part no. VEK8841. M.D.

Sony SLVE70

This machine wouldn't play tapes. It seemed that the clutch was slipping. An effective repair was carried out by replac-

ing the following items: 303, chassis block assembly, part no. A-6739-096-A; and 202, pendulum arm assembly, part no. X-3727-776-1. Also, for good measure, the mode switch, part no. 1-571-920-11. M.D.

Ferguson FV205

This machine's clock kept getting corrupted. After it had paid several visits during which the EPROM code was re-entered I eventually decided to replace the EPROM. The new code, 7709-0119-200109-3400, was entered after holding down the + and - keys on the VCR while reapplying the mains supply. M.D.

Sanyo VHR789E

Most faults with these machines can be cured by replacing PR512. With this dead one however the cure was to replace the power supply start-up resistors R5002 and R5003, which are both 560kΩ (part no. 4010214907). M.D.

Toshiba and Ferguson VCRs

Most of these machines use the same or a similar power supply unit. If the machine is dead or intermittently dead, replace CP007 (10μF, 50V) on the primary side of the

power supply. For a dull or poor display, replace CP041 (220μF, 10V). M.D.

Daewoo GB5582TXT

This TV/VCR combi unit appeared to be completely dead. The power supply was working however, but there was no voltage at the line output transformer because RLY1 was not working. In fact none of the buttons had any effect, and there was a cassette inside, still laced up.

I decided to examine the video section and discovered that there was virtually no output from a 6V regulator, circuit reference IN01, though there was plenty of input. It's a plastic 7806 type. I fitted the metal version which is more durable. No alterations are necessary. G.R.

Goodmans PD1700

This Comet model is fitted with the Philips Turbo deck. In this one the power supply was seemingly dead but ticking, the cause being a faulty loading-motor drive chip (L2722). All functions were OK once a replacement had been fitted, but the tape was being crinkled because the pinch roller was worn. The Philips part no. is 4822 528 70774. R.B.

Sharp VCM301HM

It's quite common to get machines from this range with the complaint "will not erase old sound". You will find that Q651 is leaky and R658 open-circuit. Willow Vale published a technical bulletin that recommended the following action:

Replace Q651 (2SC3203Y) with a 2SC2120Y, part no. 27010S.

Replace Q652, type DTC323TK, part no. 27848TR.

Replace R658 (4.7Ω, 0.25W), part no. 56016V.

Replace the surface-mounted 0.01μF capacitor C652, part no. 27379BC.

But note that the part no. for C652 in the WV bulletin is incorrect - order using the code in the bulletin and you will get a ceramic capacitor. R.B.

LG RC700i

The received (E-E) signals were very ragged, but playback of prerecorded tapes and recordings made via the scart input were OK. Checks around IC701 showed that the AGC reservoir capacitor C707 (4.7μF, 50V), which is connected to pin 4, had a very high ESR. A replacement cured the trouble. C.A. ■



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Peter Marlow

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JACK'S WORKSHOP

Jack Armstrong

An Amstrad SRD2000

The customer who brought me this SRD2000 boasted that he had got it second-hand "for only twenty quid". This didn't raise my spirits, because in my experience owners will pay no more than half the purchase price to get an item repaired. There was no way I was going to "look at it" for a tenner, the usual expectation in such a case.

"Can you take a look at it" he continued, "I don't think there's much wrong with it. Only the menus don't work."

I eventually agreed to look at it for a tenner, but warned him that the repair cost could be much higher.

The receiver appeared to work all right when checked on the bench but, apart from the decoder messages, there were no on-screen graphics – at least not with the UHF output. The on-screen menus were present via the TV scart connection.

A quick look at the service manual showed that IC11 performs video switching immediately before the UHF modulator. Maybe this was where the fault lay. I took off the cover and searched for IC11, which was not immediately visible. It was hidden beneath a ribbon cable near the centre of the main board and was buried in a growth of green copper salts, the result, it seemed, of a coffee spillage. Yuk! Now it would be an understatement to say that this receiver is difficult to dismantle. In fact it's a pig. I

looked at the screws and connectors, and estimated that it would take an hour to replace the chip.

So I phoned the customer who, amazingly, gave me the go-ahead to finish the repair at a cost of forty pounds! OK, fine. Out with the electric screwdriver.

Some time later I had the unit reassembled with a new MC4053 chip installed, and was ready to test it. The work had taken longer than expected, because I'd noticed that the electrolytics in the power supply were very discoloured. I had replaced them all.

The unit worked perfectly – except that there were no on-screen graphics via the UHF output! Oh dear. I looked at the circuit diagram again and saw that IC11's switching is controlled by pin 4 of the MSP3400 audio processor chip. The voltage at this pin was zero. I disconnected the series inductor and connected it to the 5V supply. This restored the on-screen graphics, but there was no audio!

I was going to have to bodge this one, because I didn't understand what was wrong. As far as I could tell, the cause of the trouble was that the MSP3400 chip wasn't switching the video path correctly. So I cut the connections to pins 4 and 5 and joined the tracks with a 100Ω resistor.

That did the trick! Since the customer was using the receiver for audio only and needed the video output just for the menus,

I wasn't bothered about any other functions – though, surprisingly, everything appeared to work perfectly.

Forty quid was a bit low for two hours' work. I bit my tongue and smiled nicely as I accepted the money.

Mac repairs

As I've mentioned before, Macintosh repairs can be lucrative. Yesterday provided an excellent example. I had a call from a young man who called himself "a mature student". He was taking a computer graphics course at the local college, after serving for seven years in the forces, and had bought a supposedly "Mac compatible" digital camera from a high street store. Unfortunately, when he inserted the installation CD into his brand-new Special Edition 500MHz DVD iMac it ran wild, deleting and corrupting several files in the system folder.

He explained that the computer, after a reboot, had declared that it was unable to find the USB drivers for the scanner, the printer and the modem. Worse, it stolidly ignored any CD that was inserted, and was unable to launch any software application without producing an error message. Since the iMac has no floppy disc drive and relies on its USB and internet connections for access to files, this was a major disaster. Even ejecting a CD was a headache, because there's no eject button. Instead, the Mac relies on dragging the CD icon to the "wastebasket". Since the CD icon was not visible, this was impossible!

"I've phoned several companies that gave me ridiculous estimates to fix it" he wailed. "But two of them gave me your name, so I hope you can help."

I told him that I prefer to carry out repairs in the workshop. Unfortunately he lives some twenty miles away and relies on public transport. A further problem was that I would need the scanner and printer as well



When you understand the basics, Macs are generally much easier to fix than PCs. This iMac had a hardware install problem.

as the computer. To be honest I didn't really want to get involved. So I quoted him £60 an hour.

"Great!" he replied, "don't worry about the money, how soon can you come?"

I groaned inwardly but, having committed myself, I agreed to go that afternoon.

On arrival I was greeted by the young man's lovely girlfriend, who asked me if I wanted a cup of tea. This was unfair. They were appealing to my base instincts. I offered to accompany her to the kitchen to help, but she declined and directed me towards the computer, while she looked for some cups.

"Isn't she gorgeous?" the young man asked, tapping the iMac's case.

"Yes" I replied, looking towards the kitchen.

"I love this computer" he continued, "and get very upset when it won't work properly."

The iMac performed as described, so I turned it off and inserted its own Software Restore CD. When I held the C key and restarted the iMac, it booted up from the CD. I clicked 'restore' when this button appeared on the screen, then sat back to drink my tea.

A couple of minutes later I was able to

reboot the computer, after which it worked perfectly – apart from demanding to know where its USB drivers were. A Find File search revealed that they weren't on the hard disk, so I took the installation CD for the Epson printer and reinstalled the software.

Unfortunately the Microtek scanner CD was nowhere to be found. So I dragged the Remote Access, TCP/IP Control Panels and Internet Preferences from the old system folder and dropped them into the new one. The iMac put them in their proper places automatically. I was then able to access the internet immediately. A quick look at the <http://www.microtek.com> web site led me to the Scan Wizard software, which I downloaded on to the hard disk.

As this half-hour process began, the girlfriend returned with more tea. I drank mine gratefully, watching the download with one eye and the girlfriend with the other. I'm that kind of age.

It took only a few more seconds to install the scanner, which then worked perfectly.

I left a happy customer, whose wallet was £50 lighter, after just an hour's 'work'. No, it wasn't work really. It was fun. When you understand the basics, Macs are generally much easier to fix than PCs.

The young man sent me an e-mail this

morning to thank me. None of his college work had been lost, and the iMac was working perfectly.

If you have any questions about Apple Macs you can e-mail Jack from the internet web site at:

<http://www.ukstav.com/jack>

You can also contact Mac Users and ask questions at the Yorkshire Mac User Group web site (YMUG):

<http://www.ymug.york.co.uk>

Information about Sky Digital Satellite receivers can be found at:

<http://www.satcure.co.uk>

You can order Apple Mac cables, connectors, batteries and other accessories from the SatCure web site at:

<http://www.satcure.com>

Test Case 464

"Funny colours on screen" it said on the job card Pam had written out. What a multitude of things that could mean! Cathode Ray took the card, along with half a dozen others, got into the big white van and hit the road. There had been a thunderstorm the previous night, so Ray was expecting a number of extra calls. He decided to get a move on.

On his arrival at the first address, where the funny colours were, our young man was confronted with a large TV set – it was about six years old. We won't bother with its make and model details, because the fault could probably arise with any type of set that has a CRT display. Ray saw a picture that was overlaid with many bows and lines of bright colours: there was a rainbow effect all over the screen. The bizarre colour pattern moved slowly – very slowly – as he watched. What on earth was happening? Ray turned down the colour, but this had no effect on the creeping rainbow. He selected the AV mode, there being nothing connected to the AV sockets, and turned up the brightness. The brightly-coloured pattern was still there.

The customer, trying to be helpful, told Ray that he could see the effect better on the blue screen produced by 'playback' of a blank tape in his VCR. When they tried this the pattern on the TV screen became, if anything, even more colourful – and "weird", as Ray put it. Interestingly, its movement over the

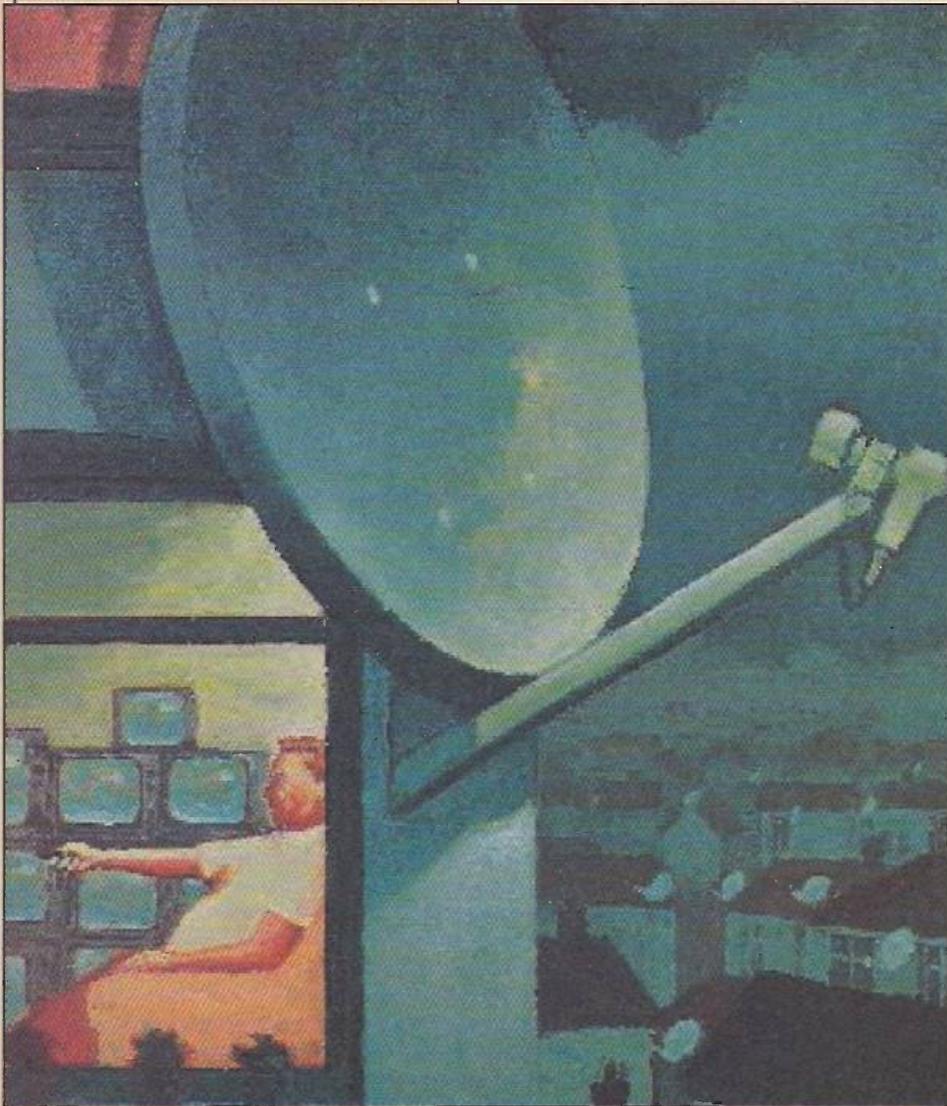
screen was now a little faster than before, with a broadcast TV picture. Was this a clue?

The job was obviously one for the workshop. So, with difficulty, the set was loaded into the van. All this bode ill for Ray's progress through the rest of the day! We'll draw a veil over that and fast-forward a couple of days, to Cathode Ray's dealings with this colourful set on the workshop bench. It has been decreed from on high that, as far as is possible, each technician should follow his jobs through from start to finish.

Ray took the back off the set and fed it with the output from a colour-bar generator. The bars were distinguishable beneath the swirls and whorls of 'interference'. In a rather futile move, Ray connected an oscilloscope to each of the CRT's three cathodes in turn. This showed that perfectly good waveforms were being applied to the cathodes, and that the drives shrunk to clean staircases when the colour was turned down. Maybe there was something wrong with the scanning waveforms? This seemed unlikely, and so it turned out – the scope showed that normal currents were flowing in both sections of the deflection yoke.

Ray began to speculate about the possibility of a faulty CRT. While he was considering this there was a coarse spluttering sound followed by the pop of a blowing internal mains fuse. What now? Ray went to the stores and got a 20mm replacement fuse of the correct type, fitted it and switched on again. There was a momentary buzzing sound, then the new fuse failed.

Were these two symptoms connected in some way? If so, or even if not, what was troubling the set? The picture tube was not the culprit, but two more fuses was sacrificed before the cure was found. For the solution to this problem, turn to page 632.



SATELLITE NOTEBOOK

Reports from
Christopher Holland
Michael Dranfield
Peter Tennant
David Smith and
David J. Snell

Signal-strength checks

Occasionally a customer complains about picture breakup on certain channels only. It can be useful to have an up-to-date list of the Sky Digital multiplex frequencies and channel allocations when you call to investigate a problem of this sort. Almost always, if the dish is correctly aligned and provides sufficient signal strength, the cause will be the coaxial feeder cable. New cable normally provides a cure.

In the absence of a spectrum analyser it's invaluable to be able to see the signal quality with any given transponder. What isn't widely known is that digiboxes have a facility to display this.

The 'signal test' menu always uses the receiver's default frequency, which is 11.778GHz V (Astra 2A transponder 4). But you might for example find that this gives a high reading while picture breakup is experienced on say Eurosport (12.382GHz H, Astra 2B transponder 35).

To get the digibox to display the signal quality with this transponder, go to the 'installer setup' menu by pressing 0 then 1, then press 'select' when in the 'system setup' menu. Select option five, the 'manual tuning' menu (see Photo 1).

The default frequency will be displayed initially. Enter the frequency and polarisation of the transponder that's causing trouble, Eurosport in our example. Remember that the symbol rate of 27.5 and FEC of 2/3 don't need to be altered – unless you require an Astra 2D transponder, when the symbol rate is 22.0 and the FEC is 5/6.

Once the frequency and polarisation have been entered, go to the 'find channels' option. Initially you will see the default frequency reading, and the lock indicator will say 'locked'. But the lock indicator will very rapidly change to 'not locked', while the transport stream identification will change from the hexadecimal default frequency reading of 07d4 to 07f3 (for Eurosport). The signal quality reading will then be that for the actual transponder (see Photo 2). Very low signal quality has been simulated in this photograph.

Pressing 'select', as the menu advises, presents a list of channels currently available with this transponder. Pressing 'back up' returns you to the signal-strength menu, where another frequency can be entered if required. To return to normal use, press the 'Sky' button.

When returning to normal use, the receiver can occasionally display "no signal being received". Don't panic. Go to the 'system setup' menu and select the 'add channels' menu. This will be set to the default frequency, 11.778GHz V. Ask the digibox to find channels on this frequency. Normally the background-menu music recommences after the search (it's transmitted on the default frequency). Press the 'Sky' button once again to restore normal operation.

The hexadecimal transport stream identifier provides a useful confirmation

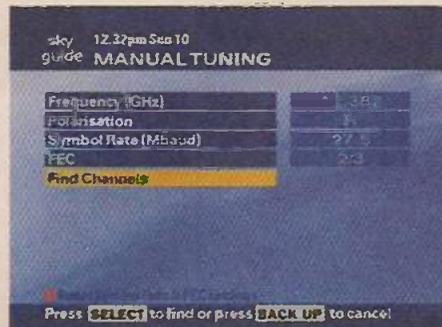


Photo 1: The manual-tuning menu, with the frequency of a required transponder (Eurosport) entered.



Photo 2: Signal strength and quality indication (very poor) with a selected transponder.

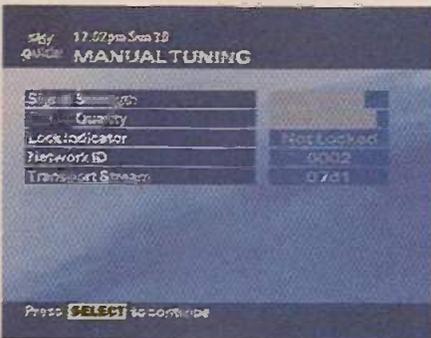


Photo 3: Manual-tuning display for Astra 2A transponder 1 (transport stream 07d1).

that you have the transponder you want. Astra 2A transponder 1 (11.719GHz H) is first at 07d1 (see Photo 3). Transponder 2 (11.740GHz V) is 07d2, transponder 10 (11.895GHz V) is 07da, transponder 40 (12.480GHz V) 07f8.

The "lock" indicator appears to show that the digibox is locked to the default frequency. Once in the manual tuning mode the digibox displays 'unlocked' whatever is being received. C.H.

Tuner repairs

The later zero-IF tuner used in Pace digiboxes from the 2400 series onwards can sometimes fail. Kesh Electronics provide a speedy repair service. Check with Gordon McCrea on 02868 631 449 or visit the company's website at www.pacelink.co.uk C.H.

Digital channel update

Table 1 lists new channels available via Astra and Eurobird, with the transponder number in brackets after the frequency and the EPG number in brackets after the channel name.

The BBC has taken a long-term lease on Astra 2B transponder 38 (12.441GHz V). It has been put to use first for showing extra tennis matches from Wimbledon.

Minaj Broadcast International (MBI), which left Astra 2 a few months ago, is

now being transmitted via Eurobird with the same EPG number. EDTV Dubai now has three transmissions via Eurobird transponder D7S. Tests are being conducted using transponder D5S (11.546GHz H).

I've noticed that some radio stations, particularly Planet Rock (861) and Core (862), transmit at a notably higher volume level than others – to the extent that you have to decrease the volume level via the TV set or hi-fi equipment. Amongst TV stations, the recently arrived Euronews on channel 528 runs at a higher volume level than almost every other channel. C.H.

Pace 2500B digibox

The customer complained about reception problems – intermittent picture freezing followed by the "no signal received" message. I took a spare digibox along with me as I suspected an LNB problem. This enabled me to establish that the cause of the fault was within the digibox, which I took back to the workshop.

Next morning it wouldn't come out of standby. Further checks led me to the tuner unit, which is different from the one used in the earlier model. Unfortunately replacement parts are not available separately: you have to order the entire ZIF module (part no. 222-0049001). When I enquired I found that the cost was only £22.33 plus VAT. The one I obtained and fitted brought the box out of standby and also cured the intermittent freezing. At such a reasonable price for a new tuner the easiest course seems to be to simply replace it. M.D.

Pace 2200 digibox installation

Most channels produced the "no signal received" message, but only after one-

two hours' operation. I called up service menu 4, setup, then 6, signal test. This showed below half signal strength and quality – whether there was reception or not! The cause of the problem was poor installation, that is dish alignment and cable routing. Once this had been attended to all was well. Presumably the stations that were lost had weaker signals. P.T.

Sky digibox handset problem

If you get faulty operation with a Sky digibox remote-control unit, i.e. some games cannot be loaded or there's incorrect operation when the buttons are pressed, it's likely that the battery is in need of replacement. This is quite a common problem, which is not explained in the user's handbook. It probably causes a lot of unnecessary phone calls. D.S.

Manhattan LT7600 Plus Mk III

There was no LNB supply voltage from either F connector. The cause, a dead short across the supply, had occurred when the F wallplate had been moved while decorating. Unfortunately the customer had tried changing from one F connector to the other, which was why both sides were dead. There's no LNB supply protection circuit.

When there's a short-circuit the switching transistors, Q202 and/or Q204, eventually burn out. In this case the board was badly scorched, so it was obvious what had happened. The adjacent diodes D200 and D210 (type 1N4148) and resistors R202 and R204 (1kΩ) were also blackened, so these were replaced as a precaution. The transistors are type A928: a 2SA933 from an SRX200 receiver is a suitable replacement. D.J.S.

Table 1: New digital channels.

Frequency (GHz)	Satellite/beam	Pol.	Channel
11-508 (D3S)	Eurobird	H	Animal Planet + 1 hour (571), Discovery Home and Leisure + 1 hour (134)
11-585 (D7S)	Eurobird	H	MBI (698), EDTV-1, EDTV Sports, EDTV Business (EPG nos. TBA)
11-680 (D12S)	Eurobird	V	Go Barking Mad (425)
12-324 (32)	Astra 2B N	V	Asian Air Radio (893)
12-382 (35)	Astra 2B N	H	God Revival (651)

N = north beam. TBA = to be announced.

WEB SERVICE

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A.R.D. Electronics Plc

<http://www.ardelectronics.com>

A.R.D.'s Website details all the information you need to know about this new and exciting electronic



component distributor. It shows how to: open an account (credit or cash), obtain a trade catalogue and place orders (both online and direct)

Baird 30 Line Recordings

<http://www.dfm.dircon.co.uk>

For history buffs and the curious here's a fascinating site containing early TV recordings and their background.

BBC

<http://www.bbc.co.uk/info/reception>

<http://www.bbc.co.uk/enginfo>

If you need any help with your reception go to this site – both of the addresses point here. There's special advice for people with loft installations, and caravanners and boating enthusiasts.

Doknet Service manuals

<http://www.doknet.com>

This Dutch site says it has 350,000 service manuals and 1 million service parts.

You interrogate the data base by filling out an order form, with the "request" box ticked, and then wait for an email to arrive back on your computer. However, an on-line index would be useful and maybe on-line downloading of the manuals.

Dönberg Electronics

<http://www.donberg.ie>



As the leading distributor for the TV, Video and Audio trade in Ireland, we supply over 2000 shops & service dept with Audio-Video and TV spares, Semiconductors, Test Equipment, Service Manuals, Remote Controls etc. At present we stock over 30,000 different lines

EURAS International Ltd

<http://www.euras.com/english>

"The definitive fault index... based on feedback from manufacturers, technicians and workshops throughout Europe" IER Magazine. Available on CD-ROM including ECA vrt-disk 2000.



Subscription includes free Internet access for update downloading, access to pin board, discussion forums and classified ad section. Monitor database also available.

Goot Products

<http://www.kiegoot.co.uk>



Kiea Trading Company is the sole agent of Goot products, We specialise in supplying the soldering and desoldering product range manufactured by Goot Japan for the UK market. Goot uses advanced production technology to manufacture high quality soldering iron products for industrial, professional and general purpose use.

MB21

<http://www.mb21.co.uk/index.html>

Another enjoyable site with a "telenostalgia" section about the technical aspects of television. There's also a section on transmitter sites, teletext "then and now", and a "rough guide" to widescreen television

Matrix Multimedia Ltd

<http://www.matrixmultimedia.co.uk>

Matrix Multimedia publishes a number of highly interactive CD ROMs for learning electronics including: Complete electronics course, Analogue

To reserve your web site space contact Pat Bunce

Tel: 020 8652 8339 Fax: 020 8652 3981



filter design, and PICmicro(R) microcontroller programming (C and assembly).

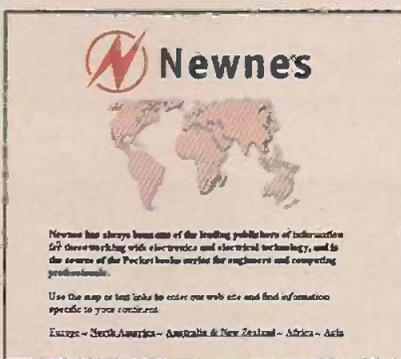
M.C.E.S.

<http://www.mces.co.uk>

The MCES site gives details of our range of service including Tuners, Video Heads, RF & IF Modules plus latest prices and special offers.

Newnes

<http://www.newnespress.com>

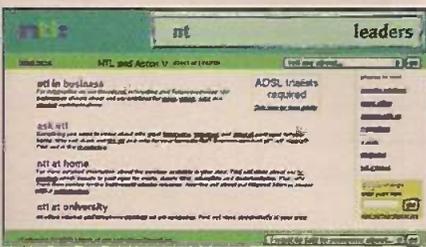


Check out this site for the latest book titles on TV & Video Servicing and Technology and their famous Pocket Book series. You can shop on-line and also register for an Email service to tell you when relevant new titles are published.

NTL

<http://www.ntl.co.uk>

Go to this site for information on NTL's Broadcast, Interactive and Telecom services, including packages for home



area by area. There's also a useful transmitter site map and database, giving locations and information. The site also contains useful documents, which describe digital TV, interactive TV and digital Radio. There's also a useful contacts list.

Mauritron Technical Services

<http://www.mauritron.co.uk>

The UK's leading independent supplier of Service Manuals and Operating Guides from valve to video. Also available on CD Rom or download direct from the internet.

PC Universe

<http://www.pc-universe.net>



PC Universe supplies core computer components at "WORLD-beating" prices. Our range of reliable brand name products is available to order online 24-7. Nationwide delivery. Free Tech support at all levels. Call LO Call 0845 4585817

Sky digital repairs

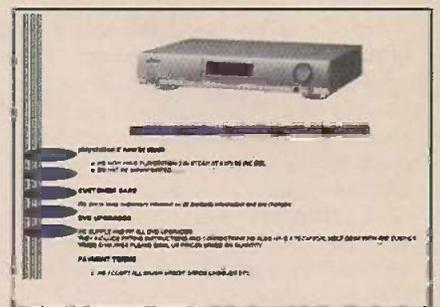
<http://www.horizonsatellites.co.uk>

The Horizon site gives details of our range of products and services including Sky Digital Receiver Repairs.

Servicing Advice

http://www.repairfaq.org/REPAIR/F_Repair.html

Here are some frequently asked questions about servicing consumer electronic equipment, with a US bias. But there's some good material on monitors and CD players and CD-ROM drives. (thanks to David Edwards for this information)



Switch-it-on

<http://www.switch-it-on.co.uk>

We sell multiregion dvd players to trade and public, also tv, videos, hifi and playstation 2. We design our own upgrades on dvd and we sell all spare parts. All makes and most models stocked.

Timecast

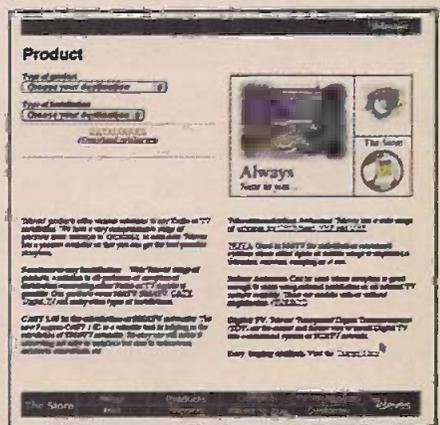
<http://realguide.real.com/stations/>

This site contains listings of TV and Radio stations available on the Internet. There are also some fixed cameras positioning in locations ranging from game park, high streets and people's houses - not exactly captive viewing! But an interesting thought - are PCs and TVs going to eventually "get married"?

Televés

<http://www.televés.com/ingles/ingles.htm>

Televés website was launched as an easier way to keep in contact with our World-wide Network of Subsidiaries and Clients. This site is constantly updated with useful information/news plus you can download info on our range: TV Aerials & accessories, Domestic and Distribution amplifiers, Systems Equipment for DTT and Analogue TV, Meters and much more.



The Service Engineers Forum

<http://www.E-repair.co.uk>

A brand new site dedicated to the needs of service engineers containing detailed servicing articles, circuits & repair tips. The site also includes for sale, wanted & special offer sections, industry news & much more. An impressive site well worth visiting.

For customers without net access, servicing product details are also available by ringing Mike on 0151 522 0053

UK Electrical Direct

<http://www.uked.com>

For a comprehensive on-line directory, buyers guide and resource locator for the UK Electrical Industry look at this site. Many of the companies listed have links to their own web sites, making this a one-stop shop for a huge amount of information.

UK Mailing List Group

<http://www.egroups.com/list/uktvrrepair>

Following on from the newsgroup discussion last month there is a UK Email group for TV technicians where you can



send an Email to everyone in the group. There's just over 30 people in the group at present. For more details and how to register look at the egroupp home page. Just a general comment though - you do have to be careful who you give your Email address to so that you can avoid "spamming" - that is getting lots of unwanted Email about dubious Russian site (amongst others).

PSA

<http://www.psaparts.com>



This web site gives details of various specialist parts for repairers, from rare semiconductors to compute batteries and printer parts. The vast majority of items are in stock, and can be purchased on-line via this site's shopping facility.

Reed Connect

<http://www.reedconnect.net/>

Another free internet access site, this time from Reed Business Information. However the site possesses a useful UK People and Business Finder, with an e-mail search. There's also business news and local information, and some good links to directory sites.



Repairworld

<http://www.repairworld.com>

Repairworld is a US based fault report database which is updated bi-weekly. It operates on a subscription basis and describes itself as an "affordable solution for all technicians". There is apparently no minimum number of months for which you have to subscribe. You can see some samples of the material for free, monitors, VCR, DVD and Camcorders being of particular relevance to UK users. The site provides a "chat room" where you can talk via your keyboard to others "in the room".

To reserve your web site

space contact **Pat Bunce**

Tel: 020 8652 8339

Fax: 020 8652 3981

Put your web address in front of 21000 electronics enthusiasts and experts. **Television** acknowledges your company's need to promote its web site, which is why we are now dedicating pages in every issue to announce your **WEB ADDRESS**. This gives other readers the opportunity to look up your company's name, to find your web address and to browse the magazine page to find new sites.

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This price includes the above mentioned information, plus a 3cm screen shot of your site, which we can produce if required.

To take up this offer or for more information ring:

Pat Bunce on 020 8652 8339
or fax on 020 8652 3981.
or e-mail: pat.bunce@rbi.co.uk

Company name	Web address



AUDIO FAULTS

Reports from
Geoff Darby
Ivan Levy, LCGI and
Robin Beaumont

We welcome fault reports from readers – payment for each fault is made shortly after publication. See page 618 for details of where and how to send reports.

Sharp CD-PC651H

This hi-fi unit produced no surround-sound output. After a false start with the output IC, I established that the voltage at pin 12 was causing it to mute. This pin is controlled by a signal called "power", which comes from the system control micro chip via some digital transistors. I assumed, incorrectly as it turned out, that this signal goes active high to switch the IC on. In fact the pin is biased on, the control signal taking it to off by connecting it to chassis potential.

The bias supply is provided by a separate rectifier circuit (a 1SS133 diode, D817, with a 4.7µF reservoir capacitor, C817). D817 was open-circuit. A replacement restored the surround sound. **G.D.**

JVC KS-RT111

There was no audio output at all from any of the four channels provided by this car radio-cassette unit. Checks indicated that the TDA8561Q output IC was faulty, though it showed no signs of distress. A replacement restored basic operation.

As so often with car radios however, this was not quite the end of the story. There was still no rear left output. One of the wires for this output was in a wrong hole in the connector shell at the back of the radio. I wonder how it got there? The owner denied all knowledge of course. Putting it back in the right place restored the missing channel. **G.D.**

Memorex SA550

This is a badged version of one of the Pioneer twin CD tray hi-fi units. There are two completely different versions of the twin-tray deck. If you've never seen one in operation, both types are extremely elegant: they perform a quite complex ballet of tray movements with remarkably few (compared to some I could mention) moving parts.

This unit is fitted with the simpler of the two – easily identified by the loading motor, pulley and rack-drive gear on the left-hand side. Its timing was out, which is quite unusual for this version. Realignment is a simple matter of removing the pulley and gear just mentioned, sliding one rack, say the top one, all the way back, ensuring that the tray is correctly located over the laser deck, then sliding the other (bottom) rack all the way out, making sure that the tray is all the way out. If either condition cannot be met, you will have to remove the gear from under the offending tray, reposition the tray with respect to the rack, then refit the gear.

Once you are happy that both trays are correctly located, push both racks firmly to their extremes, checking that the mode switch push-rods, located behind the rack gear, push down on the appropriate

switches. If you have followed the procedure as outlined above, it will be just the front-most push-rod that's down. Now refit the rack-drive gear, taking care to keep the two racks pushed firmly to the ends of their travel. The gear will now hold the racks in the correct positions. Refit the pulley and drive belt, then cycle the deck by hand, checking that the three mode-switch push-rods operate the switches at the appropriate times, i.e. one tray out, the other tray out, both trays in etc. All should now be OK when power is reapplied.

With this particular unit however all was not well. One tray stopped half way out. If you tried to make it go back with the open-close button, it came all the way out and the loading motor continued to run. I guess that this was the original problem, and that the owner had forced the deck, causing the timing problem. The reason for this odd behaviour was that two of the three mode switches were defective. Replacements restored normal operation. **G.D.**

Panasonic SV3800 DAT recorder

This machine wouldn't play tapes and kept chewing them. I stripped the mechanism down, replaced the pinch roller and regreased. But on test I found that the pinch roller didn't engage properly. Further investigation showed that a piece of metal had broken away from the exit guide, preventing the pinch roller from engaging.

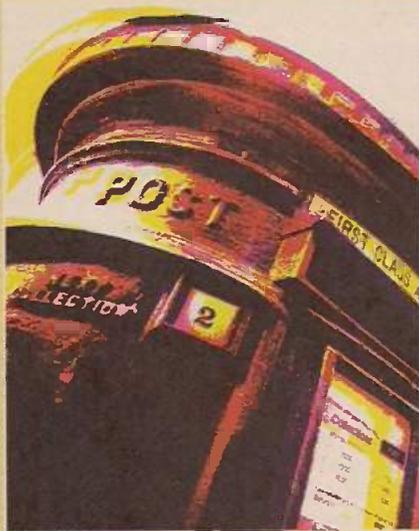
I had to strip the mechanism down completely to replace the exit guide. As the manual has no timing diagram to help rebuild the mechanism. I had to work out its operation for myself. **LL.**

Sony MZR70 MiniDisc recorder

Two of these personal recorders came into our workshop with very similar faults. Playback of discs was OK apart from those recorded by the machines. These discs either jumped wildly or produced complete silence. In both cases the magnetic overwrite head was out of position: it must be positioned exactly above the lens of the laser pickup. Careful adjustment, after slackening the securing screw, provided a complete cure. **R.B.**

Sony HCD-MD5 audio system

In the May issue Mike Leach described a problem with the loading-motor drive IC in the MiniDisc section of this equipment. Sony has produced a service kit to improve matters. It consists of an extra IC regulator subpanel which is wired into the MiniDisc PCB. The part reference no. is A-4672-837-A – but it might be an idea to check the price before you place an order! **R.B.**



LETTERS

Send letters to "Television",
Cumulus Business Media,
Anne Boleyn House,
9-13 Ewell Road,
Cheam, Surrey SM3 8BZ

or e-mail tessa2@btinternet.com
using the subject heading
'Television Letters'.

Please send plain text messages. Do NOT send attachments. Type your full name, address, postcode, telephone number and e-mail address (if any). Your address and telephone number will not be published unless requested, but your e-mail address will unless you state otherwise.

Please send ONLY text intended for the letters page. Correspondence relating to subscriptions and other matters must be sent to the office address given above.

CD-ROM service information

Steve Beeching's article on CD-ROM service information (June) was, as usual, interesting and informative. I have a small correction to make however. Steve says you can print out a full-page PDF file only by using Acrobat Reader. This is not so. If you select the graphics selection tool, which is usually to the right of the magnifying glass on the tool bar (depending on the version of Reader), you can draw a square anywhere on the screen and print this selected graphic full size on an A4 sheet.

I often use this technique to print out 64-pin ICs full page, to make them legible to me - I have increasing trouble as the years go by trying to read the pinouts as they appear in service manuals.

*Gerald Gutteridge,
Senior Technician/Trainer, Panasonic
Technical Support, Bracknell, Berks.*

DTT Take-up

In connection with the poor take-up of DTT, may I suggest that one problem is programme time-shifting, using your VCR while watching another programme? I understand that to do this requires a second STB/IDTV and a second viewing card.

With analogue reception I quite often record two programmes while watching a third. If people wish to do this with the five analogue TV channels, surely their needs will be greater when a hundred or more channels are available?

It's not that I'm a TV addict. The problem is that the broadcasters tend to transmit similar programmes, e.g. motoring/gardening/domestic DIY, during the same time slot.

This could be only one reason for the poor DTT take-up. Possibly at least half of those who have not as yet changed to digital do not realise that this problem exists.

*Richard K. Barsby,
Cheltenham, Gloucs.*

Replacement transistors

In the May issue (Letters, page 416) Simon Pearson asked about alternatives for the transistors used in the Quad 303 power amplifier. The following list is based on my notes about the types mostly supplied by Quad as spares or used in later production. I understand that the original transistors were specially-selected RCA or Fairchild types

Original	Replacement
U17219	BC546B, ZTX304 or MP5A43
U17229	BC556B, ZTX504 or MP5A93
38495	BC441
38496	BC461
38494	2N3055
40409	BC441
40411	16012 or MJ802
BC154	BC214

Further information is available via links from the Quad web site at www.quad-hifi.co.uk/

*David Benson,
Hove, Sussex.*

In reply to the letter (May issue) in which information on the 38496/38496 transistors used in the Quad 303 amplifier was requested, I understand that these can still be obtained from the company, which can be contacted at: Quad Electroacoustics Ltd., IAG Service Centre, Unit 7, Ouse Walk, Huntingdon, Cambs PE29 3QW.

The phone number is 0845 458 1122, fax 01480 413 403. Or e-mail info@quad-hifi.co.uk

There are no total equivalents for these devices, which are TO5F outline (F = flanged). With a little effort the flange can be removed, revealing a TO5 can transistor. The nearest types seem to be in the BFX range, the pnp version being hardest to find. The BFX39/40/41/87, all pnp devices, could be tried, or the 2N4036/7. Possible npn devices include the BFX84/85, the BFY34 and the 2N3053. These are some of the TO5/TO39 devices that might suit this amplifier's needs.

When I ordered recently from Quad I was supplied with a 2N5320 as a replacement for the 38495 and a 2N5322 to replace the 38496. These are TO39 unflanged transistors, so the flanges from the originals must be reused. Farnell stock the 2N5320 and 2N5322, the order codes being 359-051 and 359-063. They are listed in *Tower's Transistor Finder* issues 4 and 5.

I still use a 33, 303 combination without any failure in over twenty years.

*Ian Johnson,
Kidderminster, Worcs.*

Chip warning

I recently had an Amstrad CTV Model 3021N in for repair. The BUZ90AF chopper transistor had failed because R108 (270kΩ) had gone open-circuit. Having replaced these two items I decided, to be on the safe side, to fit a new TDA4503/3 chopper control chip as well. When I switched the set on there was an EHT rustle and sound, but the picture that appeared looked as if it had bad line pairing, and there was a faint squeal from the chopper transformer.

To cut a long story short, the original TDA4503 chip had been made in Austria while the replacement I fitted had been made in Korea. Fitting another IC, this time made in Austria, cleared the fault.

*J. Lesurf,
Dagenham, Essex.*

Ozone

A neighbour recently called me because she was concerned about the hissing noise made by the TV set she had just rented. I switched this new set on and saw, in the bottom, that the RF coil on the line output transformer was sparking. When something starts to arc it produces electrified air, i.e. ozone, which is very poisonous. A room full of it would kill you in no time at all.

The extensive ventilation provided at the back of a TV set is there not only to reduce the heat inside but also to prevent ionised air building up in the cabinet. When cold, ionised air is stable; but when heated it becomes unstable and explodes. There are reports from time to time about TV sets exploding. The cause could be ionised air.

*Gerry Murphy,
Huddersfield.*

The help wanted column is intended to assist readers who require a part, circuit etc. that's not generally available. Requests are published at the discretion of the editor. Send them to the editorial department - do not write to or phone the advertisement department about this feature.

HELP WANTED

Wanted: Service manual for the Philips TV Model 32PW9631/05 (5GFL2.30E AA chassis) or loan of a manual or photocopy. Also require teletext IC types CF70095ANF and CF72306 as used in Grundig/Toshiba sets, or a scrap board with good ICs on it. Phone Julian Salt on 07958 559 970.

Wanted: Transformer T1 for the power supply in the B&O LX2500 chassis. Paul Bentley, 43 Breach Road, Marlpool, Heanor, Derbyshire. Phone 01773 765 258.

Wanted: Main TV PCB (working) with LOPT etc. for the Philips combi TV/VCR Model 20PV220/07. David Jordan, Central Electronics, 6 Queen Street, Stirling FK8 1HN. Phone 01786 451 230, fax 01786 449 830 or e-mail david.jordan3@virgin.net

For sale: *Television* magazines for 1995 and 1996, complete brand-new spare set, never used. Best offer secures. Phone Terry Skinner on 020 7622 7762 (London SW4).

For sale: Two boxes of brand-new, unused TV valves in original boxes (lists available). Types include 30PL13, PY500, PCL83 and VT229/6SL7GT. Phone M. Maundrell on 01382 669 083 after 6pm or e-mail m.maundrell@tesco.net

Wanted/for sale: Require a bow-fronted GEC TV set with sliding doors, also BRC sets fitted with the 850 and 950 chassis with flat implosion screens. Have for sale the following: panels for the Thorn 3000 and 8000 chassis; tuners for the Thorn 2000 chassis; panels for the Philips G8 chassis. Also CTVs, monochrome TVs, record players, reel-to-reel tape recorders, VCRs, radios, valves and 405-line LOPTs. Most items must go. Philip Gay, 28 Ilminster, Dunster Crescent, Old Mixon, Weston-super-Mare, N. Somerset BS24 9EB.

Wanted: Service manual or circuit diagram for the 4.5in. Alba black-and-white mini TV Model PTV12. Photocopy OK,

costs paid. D. Lee, 16 Devonshire Place, Claughton, Birkenhead, Wirral, Cheshire CH43 1TU.

Wanted: Complete Philips K12 chassis for spares to keep a set of great sentimental value running. Particularly require thick-film RGB output modules, part no. 4822 212 20307; focus/G2 control module (U460), part no. 4822 691 10233; main smoothing block (225 μ F + 25 μ F), part no. 4822 124 40149; and an OF432 mains bridge rectifier, part no. 4822 130 30962. Phone Robert Williams on 1470 01952 274 694 (Telford, Shropshire).

Wanted: Digital processing board or IC703 (VSP chip) for the Minoka MK2183N or Akura 25/26. Robert Crooks, 42 Edenderry Village, Shaws Bridge, Belfast, N. Ireland BT8 8LG.

Wanted: A circuit diagram for the Sony BE3D chassis, photocopy OK. A line output transformer for the Huanyu Model 37C2. A CRT type A56-540X. A scrap Alba VCR6200 or tape-transport mechanism for this. A loading motor assembly for the Toshiba V711B VCR. A remote-control unit for the Philips VR6490 VCR. And finally a Sony KV25F2U CTV, tube condition unimportant. All expenses paid. C. A. Jackson, Thornbury, Sutton-on-Forest, York YO61 1EQ. Phone 01347 811 360.

For sale: 32 volumes of Newnes *Radio and Television Servicing* from about 1950 to the 1984-5 volume (four volumes, 1954-8 inclusive, missing). Price £5 per volume. Also have for sale an Avo Model 8 Mark III meter, with case and probes. Best offer considered. Phone Richard Bogazzi on 020 8658 3838 (office) or 020 8776 0476 (home). Or e-mail richard@kemo.com

Wanted: Does anyone have details of a video-to-RGB converter that could be used with a 21in. Apollo monitor manufactured in 1989? It has six BNC sockets at the back, three RGB inputs and three outputs. There is no separate sync input.

The three inputs have been tested with a pulse generator and all produce a pattern on the screen. As the monitor doesn't conform to any PC video standard it's unlikely that it could be used with a PC, but I would be interested to see if it could be used with a VCR or as a display device for a custom-built electronics circuit. Peter Bann, Basement flat, 3 St. Johns Road, Dover CT 17 9SE. E-mail bann208@yahoo.com

Wanted: Spare microcontroller board (M) for the Sony Model KVX2562 (AE2 chassis), or help with fault. At switch on there is only a blue screen and graphics, no sound. Same with scart connection. Text is OK. After ten-fifteen minutes the picture and sound return intermittently for five minutes, then stay on. Phone Mervyn Quilter on 01752 702 247 or e-mail

mquilter@bdown.freemove.co.uk
Wanted: A 9in. Emiscope tube, type 3/3, for a pre-war TV set, in new, used or as-found condition. Prepared to travel to collect. Service information for the Defiant Model TR947, dating from 1947. A 19in. CRT mask for a 1968 dual-standard Baird CTV. Copies of *Practical Television* dated Aug 1950, Aug 1954, May and July 1955; *Television and Shortwave World* magazine dated March and May 1937; and early *BRT Test Reports*, nos. 1, 2, 4 and 7. Please phone Robin Howells on 07977 770 397 after 6 pm.

Wanted: Handbook or service manual for an Iwatsu oscilloscope, Model SS5212. Phone B. Haberland on 01726 813 013.

For sale: A Ferrograph Series 5 reel-to-reel tape recorder in good working order. Complete with manual that contains circuits. Offers to T. Beddows on 01922 711 283.

Wanted: An FM/AM 9101 sound board, with ITT MSP3410 chip, for the Ferguson ICC9 chassis. Phone Mr. Davies on 01702 523 872 (Essex).

Answer to Test Case 464

- page 623 -

Cathode Ray's lack of experience had caught him out once again! He should have realised at the outset that what he was seeing on the picture was very like the effect of a degaussing coil. In fact it was just that, the degaussing coil being the one built into the set. It was being energised continuously by some sort of electrical leakage in the control posistor. Because the unwanted magnetic field was at 50Hz (mains) rate, it set up a very slow 'beat' pattern with the TV set's field scanning frequency. This accounted for the slow-crawling effect of the colour pattern, and the fact that it changed slightly when a VCR was used as the signal source. Had Ray disconnected the internal degaussing coils and applied an external demagnetising field, the symptom would have disappeared.

The set's mains fuse blew because the posistor finally failed completely, placing a low impedance across the supply. A replacement posistor and another fuse finally cured the fault, and careful examination showed that the degaussing coils were none the worse for their experience - also that the tube's shadowmask had survived intact. Had the latter become distorted, the set would have been a write-off.

Another little nugget of experience for Ray, who is now scratching his head over a 1982 Bang and Olufsen record deck . . .

NEXT MONTH IN TELEVISION

Servicing DVD players

The DVD has been a great success, and large numbers of players have been sold. They are now appearing in service departments in increasing numbers presenting their own problems. K.F. Ibrahim starts a new series on their operation and fault-finding/servicing procedures.

The WEEE Directive

What to do with redundant electronic and electrical equipment is a growing problem. As a solution, the European Commission has adopted the Waste Electrical and Electronic Equipment Directive, which will place responsibilities on manufacturers and retailers. Mark Paul explains the implications. The Directive is due to come into effect in 2006.

The RETRA servicing conference

There has never been a time of such change in the servicing trade. This year RETRA has engaged a star line-up to explain current developments. Eugene Trundle reports on the proceedings.

Mains overvoltage trip

A mains surge can destroy several components in a TV set's power supply. This trip avoids damage by triggering a relay in the mains input. It can be particularly helpful where the mains supply is suspect.

TELEVISION INDEX & DIRECTORY 2001 Plus hard-copy index and reprints service

Here's the essential repair information you need! The **Television Index & Directory 2001**, in CD-ROM form, contains the text of over 13,000 high quality fault reports on TVs, VCRs, Camcorders, Monitors, Satellite TV units, Audio equipment and CD players, searchable by make and model, plus the text of 156 Test Cases and 165 major servicing articles, from thirteen years of Television magazine. It also contains a full thirteen year index of Television, a Spares Guide, a directory of Trade and Professional Organisations, an International TV Standards guide, a satellite TV Channel Finder, a TV transmitter list and a compendium of internet resources for service engineers. The software is quick and easy to use, and runs on any PC with Windows 95, 98, ME or NT. The CD-ROM also contains a free index, worth £20, to Electronics World magazine.

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Television Index only, £36

Television Index only upgrade from previous versions, £16

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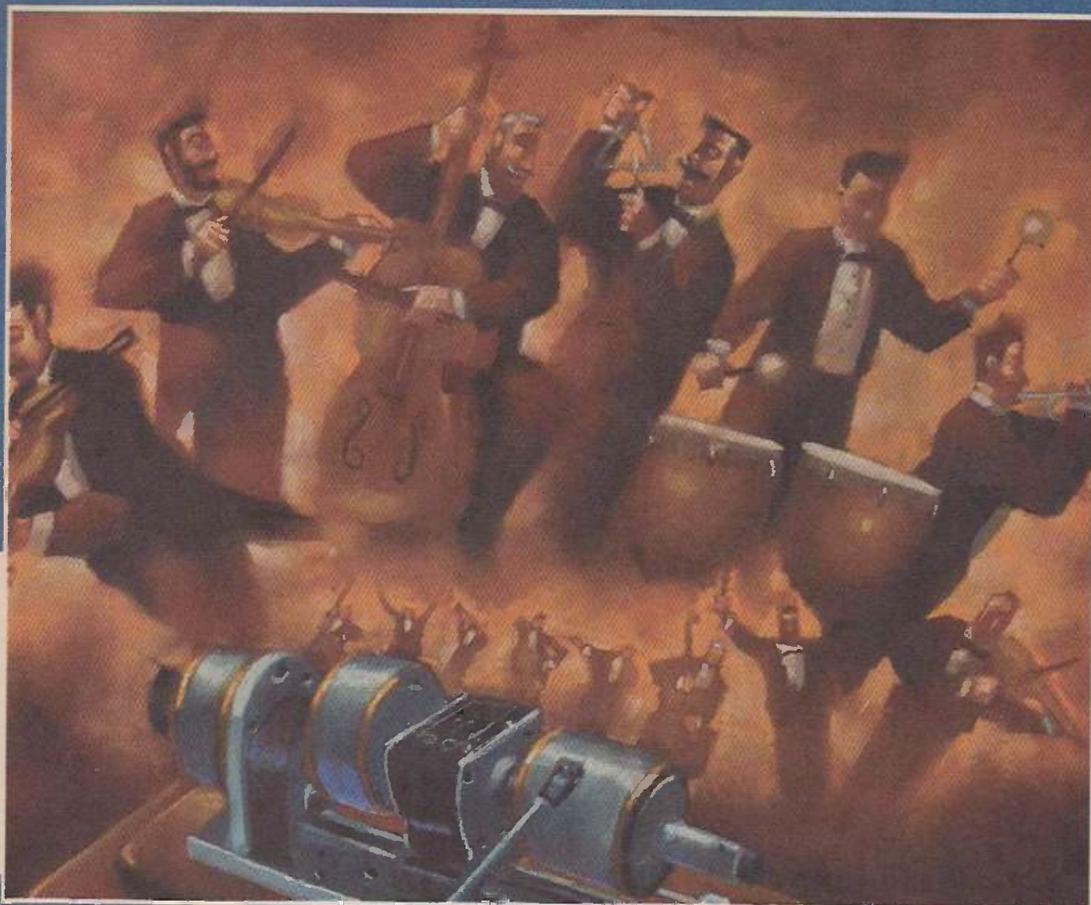
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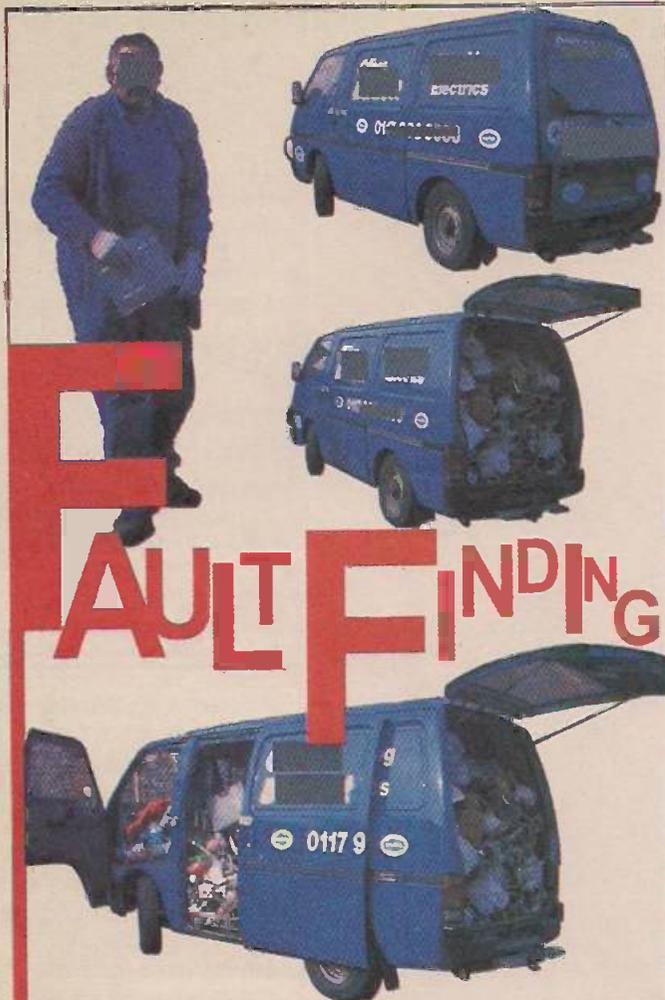
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Track

- 1 Washington Post March, Band, 1909
- 2 Good Old Summertime, The American Quartet 1904
- 3 Marriage Bells, Bells & xylophone duet, Burckhardt & Daab with orchestra, 1913
4. The Volunteer Organist, Peter Dawson, 1913
5. Dialogue For Three, Flute, Oboe and Clarinet, 1913
6. The Toymaker's Dream, Foxtrot, vocal, B.A. Rolfe and his orchestra, 1929
- 7 As I Sat Upon My Dear Old Mother's Knee, Will Oakland, 1913
- 8 Light As A Feather, Bells solo, Charles Daab with orchestra, 1912
- 9 On Her Pic-Pic-Piccolo, Billy Williams, 1913
- 10 Polka Des English's, Artist unknown, 1900
- 11 Somebody's Coming To My House, Walter Van Brunt, 1913
- 12 Bonny Scotland Medley, Xylophone solo, Charles Daab with orchestra, 1914
- 13 Doin' the Raccoon, Billy Murray, 1929
- 14 Luce Mia! Francesco Daddi, 1913
- 15 The Olio Minstrel, 2nd part, 1913
- 16 Peg O' My Heart, Walter Van Brunt, 1913
- 17 Auf Dem Mississippi, Johann Strauss orchestra, 1913
- 18 I'm Looking For A Sweetheart And I Think You'll Do, Ada Jones & Billy Murray, 1913
- 19 Intermezzo, Violin solo, Stroud Haxton, 1910
- 20 A Juanita, Abrego and Picazo, 1913
- 21 All Alone, Ada Jones, 1911

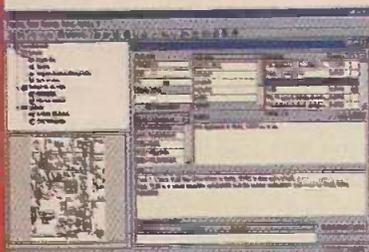
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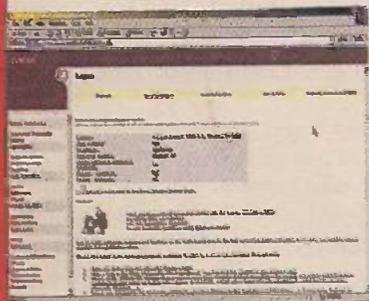


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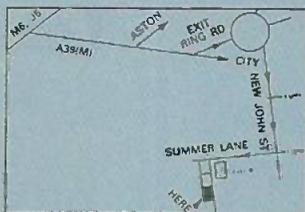
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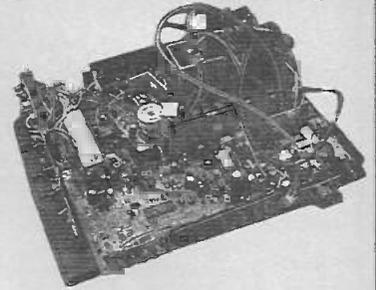
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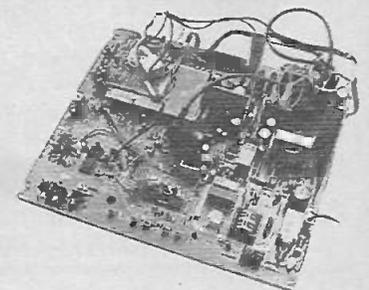
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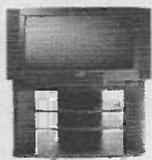
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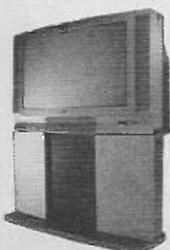
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